Investigating Why Phrase Drill Works: The Effects of Modeling and Sentence Repetition on Student Oral Reading Fluency Skills

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Matthew K. Burns, PhD, James E. Ysseldyke, PhD, Amanda L. Sullivan, PhD

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Dedication

I grew up playing with snakes, turtles, and frogs in the country with my six siblings. I grew up poorer than most in my small town. I grew up conservative, freakishly religious in a not-so-good way, and much of the time narrow minded. But ten years ago I chose to step outside of my tiny worldview and be open to others and their experiences and belief systems. It transformed my life and continues to transform my life each day. With this in mind, my dissertation is dedicated to the individuals who feel they have not found their place in this world yet and struggle with figuring out the meaning of life but remain open minded to others regardless of presumed differences or similarities. And, I dedicate my work to all the people who have chosen to love and be kind to others and all things in our world even when life has been unfair, dished out pain, and left scars. The world needs more humans like you.

Abstract

The purpose of the current study was to use a conceptual model to identify possible causal mechanisms at play in the phrase drill (PD) intervention. The study was carried out by isolating and investigating modeling and sentence repetition, which are two specific instructional components that are typically used in PD, by creating instructional variations of PD that separated the two components into two levels (low and high conditions).

The study used a two-by-two factorial, between-subjects experimental design with a control condition. Participants were 111 second grade students attending elementary school in the upper Midwestern United States. The participants were identified as being below benchmark on a grade level curriculum-based measure in reading. Participants were randomly assigned to one of the four PD intervention conditions or the control condition. Each participant received one session of one of the intervention conditions or the control. Participants were assessed using a reading fluency measure looking at both accuracy and reading rate. Results indicated modeling functions as a potential causal mechanism of the PD intervention but sentence repetition does not function as a causal mechanism. Secondly, the results provide evidence for the effectiveness of the PD intervention in increasing struggling second grade readers' ability read words accurately in connected text. Third, the results lend preliminary support for using the instructional hierarchy conceptual model to identify causal mechanisms of reading interventions specifically in the area of the acquisition stage of the hierarchy. The results of the study

were contextualized within theory and previous research. Implications for practice, directions for future research, and limitations of the study were also addressed.

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CHAPTER 1: INTRODUCTION

For the past 40 years, researchers have focused on determining the effectiveness of reading interventions (Seethaler & Fuchs, 2005) across the spectrum of reading skills (i.e., phonemic awareness, phonics, fluency, vocabulary, and comprehension) necessary to build successful readers from early childhood to adolescence. A considerable number of empirical research studies have focused on the effectiveness of reading interventions which has built up a wealth of knowledge for what interventions are effective. Not surprisingly, many effective interventions for students with reading difficulties exist to supplement classroom instruction, even for seriously impaired readers (Torgesen et al., 2001; Snowling & Hulme, 2011). However, scholars have begun to point out that the advances made in identifying effective reading interventions through empirical studies have not been met with advancing our understanding of theory connected to the interventions. This lack of a connection to theory means reading interventions are often atheorectical in nature (Compton, Miller, Elleman, & Steacy, 2014). Without strong theoretical underpinnings, researchers question the effectiveness of reading interventions and have hypothesized that the field has potentially opted for "quick fix" interventions in which reading theory has been diluted and interventions are therefore not as effective as they could be, particularly for children identified with reading disabilities (Compton et al., 2014; p. 55). The issue raised by scholars is noted most clearly in how empirical studies often do not include a strong theoretical framework or conceptual model for why an intervention works, do not identify mechanisms responsible for the effects, and do not discuss theoretical underpinnings of interventions or potential theoretical implications of

the findings (Burns 2011; Hughes, 2000; Mercer, Idler, & Bartfai, 2014). Without theory, research results may be fragmented and disconnected from the broader empirical knowledge base and the ability to interpret these findings to guide future research is limited (Linblom, 1979).

To develop highly effective reading interventions, theory and empirical evidence must be considered together and simultaneously inform one another. Particularly essential aspects of the focus of theory-driven intervention research that needs additional attention is the use of conceptual models or frameworks to guide research and the study of causal mechanisms. The use of conceptual frameworks allows researchers to interpret the findings of a current study while also providing a model to guide future research (Tharinger, 2000). Researchers also need to identify mechanisms within prevention and intervention programs because demonstrating a program's effectiveness is not sufficient on its own, and it is necessary to account for the effects of the improved outcomes (Power, 2006). Furthermore, Hughes (2000; 2015), Burns (2011), and Mercer et al. (2014) argue that researchers need to move beyond description and effectiveness studies of interventions and treatments in order to fully understand how they work. Studying mechanisms may help identify a more direct link between interventions and theory which may lead to modifying interventions to make them more effective and allow us to expand our knowledge of existing theories (Burns, 2011). Additionally, Burns (2011) suggested studying what causes intervention effects may assist in better explaining the effects of interventions, in developing new hypotheses about effects, and integrating these deeper explanations into the larger scientific knowledge base.

Scholars in the field of school psychology have recognized the need to study causal mechanisms of interventions, but few studies have focused on casual mechanisms in the area of reading intervention research. Additionally, specific conceptual models have not been laid out to provide a meaningful way to carry out this research. Although the use of an ecological perspective to development and prevention science have been proposed (Burns, 2011) and remain useful for a broader picture of understanding interventions within a systems level perspective, more specific theories and models arguably have not yet been specified.

The use of the instructional hierarchy (IH) developed by Haring and Eaton (1978) may work as a conceptual model to study mechanisms of reading interventions. Empirical evidence has consistently supported the utility of the IH in developing interventions for individual student needs depending on which of the four learning stages of the hierarchy (i.e., acquisition, proficiency, generalization, and adaption) he or she in the development of an academic skill (Burns, Codding, Boice, & Lukito, 2010; Daly, Lentz, & Noyer, 1996; Parker & Burns, 2014; Morgan & Sideridis, 2006). Given this support in its use in applied settings, the IH could also be used as a conceptual model to begin identifying and studying causal mechanisms of reading interventions based on the identified instructional components that fall within the four learning stages.

Although researchers and educators have not yet focused on using the IH as a model to study causal mechanisms in reading interventions, it has the potential to connect empirical research with theory in a way that will promote the development of theoretically driven reading interventions. This opens the possibility to bridge the

research-to-practice gap by connecting theory with empirical research in a way that can be used by educators working in schools with struggling readers (Hughes, 2015).

Statement of the Problem

Even though researchers have called for the field of school psychology to begin focusing on theory and the study of causal mechanisms when conducting research on reading interventions (as well as social, emotional and behavioral interventions), a majority of empirical studies are not yet theory driven (Hughes, 2015; Mercer et al., 2014). Additionally, studying causal mechanisms has not become a major focus within the study of reading interventions. Currently, no clear definition and process have been proposed for studying mechanisms in reading interventions and no clear conceptual models have been laid out to study possible causal mechanisms. This arguably makes it more difficult to figure out how to study mechanisms. Thus, the next critical step in reading intervention research is to consider a conceptual model that can begin to address the study of processes or mechanisms that explain what makes reading interventions work.

Purpose of the Study

The purpose of the current study was to use a conceptual model to identify possible causal mechanisms at play in the phrase drill (PD) intervention. The study was carried out by isolating two specific instructional components that are typically used in the intervention that match with the IH instructional strategies for the acquisition and proficiency stages of learning. Based on the IH conceptual model, acquisition level strategies that could function as causal mechanisms include corrective feedback,

modeling, and routine drill, and proficiency level strategies that could function as causal mechanisms include frequent opportunities to respond (repetition or practice), performance feedback, and reinforcement. Additionally, the study sought to begin building evidence for the use of the IH as a conceptual model to determine causal mechanisms of reading interventions in general.

The current study investigated the effects of modeling and sentence repetition by creating instructional variations of PD by separating the two components into two levels (low and high conditions). A control condition was also incorporated in the design. Thus, the study used a two-by-two factorial, between-subjects experimental design with a control condition. The study included second grade students identified as being below benchmark on a grade level curriculum-based measure in reading. Participants were randomly assigned to one of the four PD instructional conditions or the control condition. Each participant received one session of one of the intervention conditions or the control condition. Participants' reading performance data were collected before completing the condition and then directly after the implementation of the intervention. That is, the first read of the passage was used as the screening measure and the final read of the same passage after the intervention condition was completed was used for the posttest measures. Posttest measures of accuracy and oral reading fluency rate served as the outcome variables. Moreover, the current study sought not only to begin the process of looking at what makes PD work by carrying out an experimental study designed to look at specific instructional components of PD, but also sought to lend support to the use of

the IH conceptual model for studying causal mechanisms in reading intervention research.

Significance of the Study

An essential piece of the focus of theory-driven reading intervention research is to identify what caused the specific improvements in struggling readers' reading skills (Burns, 2011; Hughes, 2015; Mercer et al., 2014). However, there is little research in the area of reading interventions that has focused on studying the process or mechanisms for how reading interventions work. Most research has remained focused on effectiveness of the intervention but researchers have been challenged to broaden their research scope to include looking at causal mechanisms (Burns, 2011; Hughes, 2015). The current study is one of the first to critically examine specific intervention components using an empirically grounded theory of learning to determine possible causal mechanisms of the PD intervention. Thus, the study aimed to help build empirical support for the IH conceptual model in hopes that it can also be used for future studies to identify and examine causal mechanisms of other reading interventions in addition to PD. In turn, the goal is to build a stronger theoretical foundation for reading interventions that ties closely to the empirical evidence so that reading interventions will be more effective and efficient in real-world contexts with struggling readers.

Research Questions

The following research questions guided the study:

1. What are the differences in accuracy and rate of words read correct per minute between the final readings of students in the PD conditions and those in the control condition?
2. What differences exist in students' accuracy of words read on the final read of the story passage based on the modeling component in the phrase drill intervention?
3. What differences exist in students' rate of words read correct per minute on the final read of the story passage based on the modeling component in the phrase drill intervention?
4. What differences exist in students' accuracy of words read on the final read of the story passage based on the repetition component in the phrase drill intervention?
5. What differences exist in students' rate of words read correct per minute on the final read of the story passage based on the repetition component in the phrase drill intervention?
6. To what extent does an interaction occur between modeling and repetition components of the phrase drill intervention in effecting the accuracy of words read on the final read of the story passage for students?
7. To what extent does an interaction occur between modeling and repetition components of the phrase drill intervention in effecting the words read correct per minute on the final read of the story passage for students?

Definition of Key Terms

Acquisition: The first stage of the IH in which the learner is beginning to acquire a skill and therefore performs the skill at a low level of accuracy, making frequent mistakes (Haring & Eaton, 1978).

Adaption: The fourth and final stage of the IH in which the learner must learn to apply the skill to new problems or situations (Haring & Eaton, 1978).

Causal mechanism: For the purpose of reading interventions, causal mechanism is defined as the instructional components of reading interventions that are most directly responsible for the effect in improving students' reading skills. Given the potential confusion surrounding the use of various terms to study causal mechanisms and to promote consistent language, I will use "causal mechanism" or "mechanism" in relation to reading interventions throughout this paper.

Generalization: The third stage of the IH in which the learner is accurate and automatic/fluent in a skill but has yet to generalize the use of a skill to novel contexts (Haring & Eaton, 1978).

IH Conceptual Model: This term is used to describe the conceptual model proposed in the current paper to study causal mechanisms of reading interventions. The model is based on the instructional hierarchy (Haring & Eaton, 1978).

Instructional Component: The causal mechanisms that make reading interventions effective are broadly be identified as intervention or instructional components in the current study. Intervention components may include instructional techniques, instructional strategies, or learning strategies (Joseph, 2014).

Instructional Hierarchy: The instructional hierarchy (IH) is a theory of learning developed by Haring and Eaton (1978) designed to support educators in schools to develop and use more effective and efficient planning and instruction methods based on systematic guidelines. The IH theorizes that individuals develop skills through a hierarchy in which different instructional procedures or strategies support skill development at each stage in the hierarchy. The stages of the hierarchy include acquisition, proficiency, generalization, and adaption. The proficiency stage may also be known as fluency and the adaption stage is often called application or adaptation. For the purposes of this paper, proficiency and adaption will be used.

Modeling: An instructional component of PD where the instructor provides corrective feedback when a student incorrectly reads a word by providing a model of the correct pronunciation of the error word(s). Errors include substitutions, omissions, mispronunciations, or hesitations for more than three seconds. For the purposes of the current study, modeling is used more generally and includes both word modeling (providing pronunciation of entire error word) which is considered a high level of modeling and sound prompt (providing a model of the first sound of the error word) which is considered a low level of modeling.

Phrase Drill: PD is a reading fluency intervention focused on supporting readers in learning words they do not know by using a specific error correction procedure to increase accuracy of word recognition in the context of connected text (Daly, Chafouleas, & Skinner, 2005; O'Shea, Munson, & O'Shea, 1984). A basic PD intervention involves having the teacher model the correct pronunciation of any words the student misread

during their initial read of the designated passage and then the student immediately repeats the incorrect words back to the teacher. The student then rereads each meaningful phrase or sentence with error corrections up to three times and continues on to following sentences with any errors within the connected text passage.

Proficiency: The second stage of the IH in which the learner is able to perform the skill correctly and accurately but has not yet built the capacity to perform the skill at a fluent rate or automatically (Haring & Eaton, 1978).

Sentence repetition: An instructional component of PD that involves the student rereading a sentence with error word(s) one to three times after receiving corrective feedback and modeling for the error word(s).

Reading fluency: Reading fluency is comprised of accurate word recognition, rate of reading, and prosody (Kuhn & Stahl, 2003; NICHHD, 2000; O'Connor, White, & Swanson, 2007; Rasinski, Homan, & Biggs, 2009). Accuracy in word recognition means that a student is able to recognize and decode words correctly and quickly (Hudson, Lane, & Pullen, 2005). Reading rate is the ability to read with appropriate speed and fluidity through connected text such that the student has attained automaticity in word recognition. Prosody refers to the use of proper expression during reading (Schreiber, 1991; Kuhn, 2004/2005). For clarity in the current study, the term "reading fluency" was used in general to describe the reading skill that was the focus of the PD intervention. A measure of reading fluency called a curriculum-based measure of reading (CBM-R) was used for intervention and assessment purposes.

Delimitations

The following limitations were placed on the study:

(a) Study participants were limited to 2nd grade students who were considered below benchmark based on a set criteria specific to the study. Students in second grade were chosen because developing reading fluency skills is particularly important for second grade students (Snow, Burns, & Griffin, 1998).

(b) The study targeted two instructional components used in the PD intervention. These components were defined based on previous empirical studies conducted on PD. Other PD interventions may use different variations of the instructional components used in this study but for the purposes of carrying out an experimental study the components were confined to specific parameters.

(c) To maintain a level of simplicity in terminology, modeling is used to describe the overall error correction and feedback procedure used in the intervention conditions. However, the type of modeling used in the conditions may also be more broadly generalized as a form of corrective feedback. The author decided to use modeling throughout the paper rather than corrective feedback as the designated instructional component to study because corrective feedback is a broader, less specific term.

(d) Assessment and instruction was conducted by using the same story passage rather than using a separate assessment passage and instructional passage.

Thus, the study only looked at the effects of the intervention conditions on the practiced passage. This is in line with the need to focus instructional efforts on learning the words in one passage when at the acquisition stage of the IH. The use of additional novel passages would be in line with interventions focused on the generalization stage of the IH and were therefore not necessary to include in this causal mechanism study.

(e) The study assumed that all participants lacked reading fluency skill development rather than lacking motivation and therefore a performance treatment was not included. However, students were all similarly praised for reading words correct after error correction and modeling and after reading the entire story passage.

Organization of the Dissertation

This dissertation is organized into four additional chapters. Chapter 2 includes an overview of the literature relevant to the importance of studying causal mechanisms for reading interventions, the proposal of a conceptual model that can be used to study causal mechanism research in reading, how to conduct research on causal mechanisms for reading interventions, and then applies the conceptual model to identifying potential causal mechanisms for the PD intervention. An outline of the methodology used in the current study is included in Chapter 3. The characteristics of participants and setting of the study, the materials and measures used for screening, intervention procedures and assessment, the PD intervention conditions, the implementation procedures, the research design, and data analyses are described. Chapter 4 includes a presentation of results for

each research question with tables to guide the support interpretation of the data. Chapter 5 includes a discussion of the results based on the research questions and hypotheses within the context of the previous research. This chapter also lays out implications for practice and theory, directions for future research, and a review of the limitations of the study.

CHAPTER 2: LITERATURE REVIEW

Chapter 2 outlines the relevant literature in studying causal mechanisms for reading interventions. The chapter is organized into four sections. The first section goes over the importance of studying causal mechanisms for reading interventions, which examines the reasons for studying causal mechanisms in the area of reading interventions and then provides a working definition for causal mechanisms. The second section discusses a conceptual model that can be used to study causal mechanism research in reading based on reviewing theories and empirical evidence in the field of academic instruction and intervention research. The next section examines the literature on how to conduct research on causal mechanisms. The final section then seeks to apply the conceptual model to identify causal mechanisms for the Phrase Drill Intervention. This section provides a review of the literature on the Phrase Drill Intervention followed by how the current study used Phrase Drill as a means to begin identifying causal mechanisms in an effort to build empirical support for the proposed conceptual model. The chapter concludes with a summary of the importance of developing a focus on research that examines causal mechanisms in reading interventions.

Importance of Studying Causal Mechanisms for Reading Interventions

The ability to read remains one of the primary prerequisites for success in society today and the stakes for learning how to read in the early elementary grades are high. Even with such high stakes, as of 2015 only 36% of students in fourth grade and 34% in eight grade are reading at or above the proficiency level of achievement on the National Assessment of Educational Progress reading assessment (National Center for Education

Statistics [NCES], 2015). Thus, there remains an urgent need to focus on creating quality core reading instruction along with high quality reading interventions so that all students meet grade-level proficiency standards.

In recent years, researchers have moved toward a focus on determining the effectiveness of reading interventions (Seethaler & Fuchs, 2005) across the spectrum of reading skills (i.e., phonemic awareness, phonics, fluency, vocabulary, comprehension) necessary to create successful readers from early childhood to adolescence. Although there are many effective interventions for struggling readers, even for seriously impaired readers (Torgesen et al., 2001), Compton et al. (2014) questioned the effectiveness of reading interventions used for children with reading disabilities and hypothesized that the field as a whole has diluted reading theory. The desire for "quick fix" (Compton et al., 2014, p 55) interventions has potentially compromised the effectiveness of reading interventions targeted at treating word-reading and reading comprehension deficits. Instead, reading interventions should be contextualized within theory and supported with empirical evidence, which should then inform practice (Snowling & Hulme, 2011).

Both theory and empirical evidence must be considered in reading intervention research. Hughes (2000) criticized research in the field of psychosocial interventions because it primarily focused on identifying what interventions work and did not include strong theoretical frameworks for why treatments work or what mechanisms were responsible for each of the treatment's effectiveness. Hughes (2000) argued that "A thriving science of school-based intervention requires reciprocal and lively interaction (co-action) between empiricism and theory" (p. 302). More recently, Hughes (2015)

reviewed the progress made since Hughes (2000) on the inclusion of theory in intervention research and found that recent research published in 2013 and 2014 in three journals (*Journal of School Psychology, School Psychology Review, School Psychology Quarterly)* was more theory driven. The field is moving in the right direction but Hughes (2015) also noted the need for continued progress such as testing mediational pathways and including follow-up assessments at least one year later from time of intervention implementation.

Along with Hughes (2000, 2015), other researchers have also recommended the need for causal mechanism research. Power (2006) indicated researchers need to identify mechanisms within prevention and intervention programs because demonstrating a program's effectiveness is not sufficient on its own, and it is necessary to account for the effects of the improved outcomes. Burns (2011) substantiated the need to study causal mechanisms in intervention research, suggesting that studying causal mechanisms has theoretical implications. For example, studying mechanisms may help identify a more direct link between interventions and theory which may lead to modifying interventions to make them more effective and allow us to expand our knowledge on existing theories. Additionally, Burns (2011) suggested studying what causes intervention effects may assist in better explaining the effects of interventions, in developing new hypotheses about effects, and integrating these deeper explanations into the larger scientific knowledge base.

More recently, Mercer et al. (2014) conducted an analysis of the extent to which current social, emotional, behavioral, and/or academic intervention studies published

between 2007 and 2012 in four school psychology journal included components of theory-driven program evaluation. Components included specification of a causal program theory, assessment of program theory constructs, mediation analysis, moderation analysis, and discussion of theoretical implications. Mercer and colleagues (2014) found that out of a total of 94 articles that met inclusion criteria, 48% (45) met criteria for specification of causal program theory, 37% (35) met criteria for assessment of program theory constructs, 7% (7) included mediation testing, 20% (19) conducted moderator analyses, and 37% (35) discussed theoretical implications of their results. This study built on Burns (2011) call to discuss theoretical underpinnings of interventions and include discussions of theoretical implications of findings. Overall, it sheds light on the degree to which intervention research in the field of school psychology is including theory in a meaningful way.

One particularly essential piece of the focus of theory-driven intervention research that needs additional focus is the study of causal mechanisms. The primary goals of scientific research in school psychology include describing, explaining effects, and understanding how or what causes such effects (Shavelson & Towne, 2002). The last goal is not often the focus within applied psychological and educational research because attention is most often focused on identifying what treatments and interventions work. Hughes (2000; 2015), Burns (2011), and Mercer et al. (2014) argued that researchers need to move beyond description and effectiveness studies of interventions and treatments in order to fully understand how they work. Thus, the next critical step in reading intervention research is to study the process or mechanisms for how the effect is

happening (Shavelson & Towne, 2002). The following section of this chapter examines three important reasons for studying causal mechanisms in the area of reading interventions in more depth, and then provides a working definition for causal mechanisms for reading interventions.

Increasing Effectiveness and Efficiency

One of the most important reasons for studying causal mechanisms in reading interventions is for its general utility in creating more effective and efficient interventions (Burns, 2011; Kazdin & Nock, 2003; Tharinger, 2000). Currently, there are many reading interventions and programs that focus on similar reading skill deficits. For example, several reading interventions are available that focus on reading fluency skills which often incorporate various instructional components and strategies (i.e., modeling, error correction, performance feedback, cueing/prompting, reinforcement, frequent and high opportunities to respond) that are thought to support students in gaining proficient reading fluency skills (Daly, Lentz, & Boyer, 1996). The fluency interventions may be evaluated for effectiveness, but little is known about what actually caused the effects because the programs are implemented as packages of treatment components (Burns & Wagner, 2008). Researchers usually do not parse out intervention components to understand what caused the specific improvements of reading skills (Hughes, 2015).

Furthermore, reading interventions are often developed within diverse instructional curricula, inspired by diverse theories, are not often well defined, may be simplistic and focused or broad and complex, and developed and studied for different purposes (Joseph, 2014; Pressley, Graham, & Harris, 2006). By studying causal

mechanisms, we can look at separate instructional components utilized within an intervention and empirically identify what components are essential and what ones are unnecessary. Moreover, understanding reading intervention mechanisms would allow for identifying the necessary, sufficient, and facilitative ingredients to create optimal intervention manuals across reading skill development (Kazdin & Nock, 2003). For example, the many reading fluency interventions that exist now may be simplified to the use of only a few interventions that are most efficient and effective for the majority of struggling readers. These few interventions may then be modified based on individual student need with close direct assessment of skill growth. Therefore, understanding the mechanisms may help with optimization of intervention and use of instructional time. It also has the potential to reduce the time needed to provide interventions for students and can help figure out the intensity and dosage to obtain optimum reading competence outcomes.

Ability to Identify Mediators and Moderators

A second reason to study what makes reading interventions work is the potential to identify mediators and moderators. Mediators are generally defined in the psychological sciences as intervening variables that statistically account for the relation between the independent and dependent variable (Baron & Kenny, 1986). Mediators may be useful to identify because they may point to possible mechanisms. Yet, caution is necessary in identifying mediators because they are not necessarily mechanisms and may not explain mechanisms but only act as a possible proxy for other variables (Kazdin, 2007). Furthermore, academic interventions differ from typical psychosocial

interventions and other more extensive studies of treatment programs because identifying psychological processes is not the main purpose which may call into question the validity of using this approach for academic interventions.

Identifying moderators within reading interventions may be useful because it allows for a more comprehensive picture of what makes reading interventions work in real-world contexts (Burns, 2011). Moderators are typically described as characteristics that influence the direction or the strength of the relation between the independent variable and the dependent variable (Baron & Kenny, 1986). Moderators may be important to consider related to reading interventions because they may relate to mechanisms by suggesting different processes are involved (Kazdin, 2007), and help us identify if there are possible variables or factors on which the effectiveness of a specific reading intervention may depend. They may shed light on what the necessary, desirable, and sufficient conditions are to make an intervention successful in a given learning environment (Sheridan & Gutkin, 2000). Although there are likely a considerable number of moderators for reading interventions that may influence the outcome, some moderators may be more influential and worthwhile to identify. Possible moderators specific to reading interventions may include duration, frequency and intensity, timing, fidelity of implementation, delivery of services (e.g., group size), teacher training and knowledge level, type of interventionist (e.g., teacher, paraprofessional, peer), instructional level, characteristics of the child (e.g., motivation, age, disability status), and level of family involvement (Denton, 2012; Foorman, Breier, & Fletcher, 2003; Lyon & Moats, 1997).

Testing and Advancing Theories

A third reason to study causal mechanisms within reading interventions is to test existing theories and build the empirical basis for established broad theories such as learning, psychological, cognitive, reading, and behavioral theories. It is also possible to develop and support smaller theories specific to interventions (Lipsey, 1993; Mercer et al., 2014). Studying causal mechanisms in reading interventions may be the necessary research area that connects the success of reading interventions to theory (Hughes, 2000; 2015). It may bridge the research-to-practice gap and connect theory with empirical research and advance the field (Burns, 2011; Hughes, 2015).

Working Definition of Causal Mechanism for Reading Interventions

Scientists across fields continue to grapple with how to define causal mechanisms (Hedström & Ylikoski, 2010; Kuorikoski, 2009; Mahoney, 2001). The social sciences in general, and within the field of psychology more specifically, has defined and understood causal mechanisms in various ways and different terms have been utilized over the years (see Hedström & Ylikoski, 2010; Kazdin, 2007; Mahoney, 2001). Perhaps the varying conceptualizations of causal mechanism could be because defining and characterizing mechanisms in one area of study may not be informative if applied to another area of study because of the different phenomena being studied (Kuorikoski, 2009). Additionally, there are different theories of causation and combining *causal* and *mechanism* into one term brings with it certain assumptions and implications. Understanding the history and assumptions behind the use of mechanistic perspectives and causal approaches is important but beyond the scope of the current study. Readers are

encouraged to examine the literature on the philosophy of social sciences (see Bunge, 2004; Norkus, 2005), and methodology and scientific explanation literature (see Cook & Campbell, 1979; Shadish, Cook, & Campbell, 2002) for a deeper and more nuanced understanding of the terms.

Although causal mechanism may be defined to meet different purposes, Hedström and Ylikoski (2010) suggest there are four general ideas shared between various definitions of the term. They suggest a mechanism is identified by the type of effect it produces, it is irreducibly a causal notion, it has a given structure, and mechanisms form a hierarchy in which there are often lower and higher level mechanisms related to one another. Thus, causal mechanisms describe the nuts and bolts (or cogs and wheels) of a causal process through which an outcome was brought about (Elster, 2007). Causal mechanisms explicitly describe how the cause led to the given effect(s). More specifically, mechanisms identify the intervening processes or components through which an independent variable has an effect on a dependent variable (Mahoney, 2004).

No definition or characterization of mechanism has been proposed for studying causal mechanisms in reading interventions. Looking at general definitions used to study mechanisms in different fields is a useful place to start. Furthermore, a definition that fits the area of study must consider the goals of reading interventions overall and the purpose of studying mechanisms for reading interventions in particular. The primary goal of a reading intervention is to improve the competence of struggling and developing readers often by helping to improve specific reading skill deficits (i.e., phonemic awareness,

decoding, fluency, vocabulary, and comprehension). In relation to causal mechanisms, we therefore want to know what systematic aspects, instructional components, or procedures make a reading intervention effective and lead to the improvements in students' specific reading abilities. The goal is to identify the active ingredients of the intervention. Therefore, causal mechanisms for reading interventions may be defined as instructional components or strategies of reading interventions that are directly responsible for the effect in improving students' reading skills. This definition provides sufficient specificity but also provides potential breadth to what may be considered a mechanism within a reading intervention. This may allow space to consider a possible hierarchy of higher and lower level mechanisms at work within reading interventions. It also allows there to be possible combinations of aspects or components interacting as mechanisms in making a reading intervention work.

Synthesis

Studying causal mechanisms is an essential but often forgotten aspect of reading intervention research. Currently, very few studies have focused on the study of causal mechanisms of reading interventions. Studying mechanisms is essential because it can create more effective and efficient interventions, support identification of mediator and moderators which can improve our understanding of how reading interventions work most effectively in real-word contexts, and also allows for testing and advancing existing theories and building the empirical basis for established theories related to reading interventions. Of prime importance is the possibility to bridge the research-to-practice gap by connecting theory with empirical research in a way that can be interpreted by

school psychologist practitioners and educators working in schools (Hughes, 2015). By defining causal mechanisms in reading interventions through identified instructional components, the terminology readily applies to the educational environment and teachers may find it easier to develop effective reading interventions.

Conceptual Model for Causal Mechanism Research in Reading

A conceptual model best able to capture mechanisms in reading interventions must consider that there may be aspects present across effective academic interventions that point to causal mechanisms at work within reading interventions (Kazdin, 2007). Kazdin (2007) offered recommendations for how to improve the empirical investigation of mediators of change and causal mechanisms and the first recommendation was that theory and specific conceptual models should be used to guide research studies. More specifically, Kazdin recommended that a conceptual model used to conduct research should have a strong theoretical foundation and support the current empirical research in addition to providing a way to synthesize and understand how the evidence points to causal mechanisms and ways to dig deeper to study mechanisms. The model must recognize and account for other variables involved that may impact outcomes such as moderator effects in addition to any mechanisms at work. The model should also provide a concrete way to test for causal mechanisms that can be conducted in applied settings.

One potential way to begin building a model is to consider the current empirical evidence and theories about academic interventions in general and reading interventions in particular. Although the current research for the study of mechanisms in reading interventions is minimal, there are empirical studies and syntheses of literature (meta-

analytic studies) that can point to possible mechanisms and suggest a place to begin looking more closely. Additionally, the knowledge base available for reading instruction, reading development, and reading theories is considerable and often closely linked to empirical research conducted on reading interventions (Daly et al., 1996).

Understanding Aspects of What Make Academic Interventions Work

Burns, VanDerHeyden, and Zaslofsky (2014) conducted a synthesis of meta-analyses of academic interventions and suggested five empirically supported criteria for effective academic interventions. The five aspects identified were (a) correctly targeted the student's skill deficit, (b) explicitly taught the skill, (c) provided an appropriate level of challenge, (d) provided high opportunity to respond, and (e) included immediate feedback. Burns and colleagues' (2014) synthesis of intervention research provided the first step in understanding what makes academic interventions work by identifying the overarching aspects that make most interventions effective in general. Each aspect identified is linked to strong empirical support across intervention research in addition to potential empirical evidence beginning to show differentiated effects within specific interventions.

The next step in developing a conceptual model to identify causal mechanisms of reading interventions is to understand what makes reading interventions work in particular. Based on the suggestions provided by Burns et al. (2014), reading interventions are likely effective based on different instructional components depending on the learning needs of students. More specific evidence for this claim is provided by looking specifically at the IH laid out by Haring and Eaton (1978). The IH provides a

way to conceptualize where a student's skill development is at and how this differentially relates to what intervention should be used and what instructional procedures and strategies will be effective. Thus, the IH is a potential model to frame the study of causal mechanisms in reading intervention research.

Instructional Hierarchy

In general, the IH was designed to support educators in schools to develop and use more effective and efficient planning and instruction methods based on systematic guidelines (Haring & Eaton, 1978). The model is theoretically and empirically grounded. It is strongly tied to principles of behavior and continues to be used by behavior analysts (Ardoin & Daly, 2007). Additionally, though often not described in the literature, the IH is tied to comprehensive theories based on child development, behavioral theories, cognitive theories, and theories of learning in general (Gagne, 1985). More recently, it has been tied to our understanding of prevention science and ecological systems theories (Burns, 2011; Hughes, 2015).

The IH is useful for supporting student learning because it seeks to generate instructional treatments based on level of skill development. It focuses on the instructional variables that can be manipulated to improve student outcomes based on assessments that measure student responding (Daly et al., 1996). The IH theorizes that individuals develop skills through an instructional hierarchy in which different instructional procedures or strategies support skill development at each stage in the hierarchy of learning (Haring & Eaton, 1978). The stages within the IH include

acquisition, proficiency, generalization, and adaption, and are discussed below based on Haring and Eaton's (1978) description.

Description of IH stages. The acquisition stage is the first step in learning a new skill. In this stage, the learner is not able to perform the task with a high level of accuracy and may make frequent mistakes. Therefore, the emphasis within this stage is on accuracy of response. Although different levels of accuracy may be considered acceptable depending on the skill, the effective instructional strategies are likely the same regardless of the academic skill being learned. Effective instructional strategies proposed for this stage include explicit instruction, demonstration, modeling, cueing, prompting, and immediate feedback. By the end of this stage the learner is able to perform the skill accurately with little support.

After a skill becomes reliably accurate, the next stage in the hierarchy involves becoming fluent or proficient in using the skill. Within the proficiency stage, the learner is able to perform the skill correctly but has not yet built the capacity to perform the skill at a fluent rate. The learner often performs the skill slowly with hesitations. The focus within this stage is on developing the speed at which the skill is performed. Although various definitions of fluency and levels of performance may exist based on different skills, the proposed instructional strategies that lend to student outcomes in the proficiency stage include frequent opportunities to respond through repeated novel drills and practice, performance feedback, and reinforcement. By the end of this stage, the learner retains knowledge of the skill, has learned the skill to the necessary level such that it can be combined with other skills, and is as fluent as peers on the skill.

The third stage within the IH is generalization. Within the generalization stage, a learner goes from using a skill within restricted contexts to being able to generalize the use of a skill to novel contexts. The proposed instructional strategies include providing discrimination and differentiation training through sufficient exemplars and stimulus conditions to support generalization. By the end of this stage, the learner is able to use the skill across settings, people and situations, and does not confuse the target skill with similar skills (Ardoin & Daly, 2007).

The last stage is adaption. The adaption stage is often called application. By this stage in learning a skill, the learner is accurate, fluent, and is able to apply a skill to novel situations and settings without support or prompting. However, the learner may not yet be able to take the skill and modify or adapt responses to new problems or situations. Instructional strategies such as problem solving, simulation, or opportunities to practice skill with small modifications in new situations may facilitate adaption. This stage will likely be continuous as a student continues to develop in their skills across time.

Current uses of the IH. In the last 30 plus years, Haring and Eaton's (1978) IH has become a useful model for targeting academic instruction and interventions to individual student's needs. It has successfully established a way to choose instructional procedures that have a high probability of success for students based on instructional strategies that work at the four stages of learning. Forms of the IH are now widely used within classroom settings and by researchers studying instruction and interventions with evidence for effectiveness in serving students struggling academically (Ardoin & Daly, 2007; Daly & Martens, 1994; Morgan & Sideridis, 2006; Szadokierski, 2012).

More specifically, Daly and colleagues (1996) proposed that the IH could be utilized as a conceptual model in order to understand the effective components of reading interventions and to be able to identify what makes different reading interventions effective. This in turn would provide a useful instructional decision making approach. They proposed that the instructional strategies described by Haring and Eaton (1978) could be considered treatment components that work within reading interventions. They argued the use of an empirically grounded conceptual model for academic responding would link assessment to intervention and make it easier to identify levels of student academic responding in order to develop interventions with a higher likelihood of success. Daly et al. provided support for using IH as a conceptual model by reviewing empirical studies that demonstrated effectiveness in each stage and type of academic responding desired.

The IH could also provide a way to clarify and refine the role the treatment components (i.e., instructional components) play based on the available empirical research. One of the essential aspects of the IH is that it focuses on refining interventions by identifying and developing what instructional strategies make the intervention effective for learning a skill along the IH stages (Daly et al., 1996). For example, demonstration, modeling, cues or prompts, routine practice, and immediate feedback are important during the acquisition phase because they build accuracy of responding (Daly et al., 1996). At the proficiency stage, using high opportunities to respond (novel and repeated practice), performance feedback, and reinforcement are important for improving speed or rate of responding (Burns, Riley-Tillman, & VanDerHeyden, 2012). The

generalization stage requires reinforcing across contexts and settings while the adaption stage requires that a learned skill be adapted or modified to meet the demands of novel situations (Daly et al., 1996). Both generalization and adaption have not been as widely studied which may be because both are more difficult to measure and adaption by definition applies to a wide context of skills such that it is not specific or discrete (Haring & Eaton, 1978). Overall, IH framework assumes different principles of learning apply at each stage of responding in the IH and therefore different corresponding instructional components will lead to mastery of a skill the quickest versus other instructional strategies used in the other stages.

Empirical Support for the IH. Empirical evidence supports the utility of the IH in developing interventions for individual student needs depending on his or her IH stage. Much of the empirical evidence supporting the IH used brief experimental analyses or single-case design methodology, but meta-analytic methodology has also been used to understand types of effective interventions based on different interventions or treatment components used in studies.

Daly and Martens (1994) used the IH to compare the effects of three reading fluency interventions (listening passage preview [LPP], subject passage preview [SSP], and taped words [TW]). Both the TW and LPP interventions included an acquisition instructional component (i.e., modeling of unknown words), but SSP did not. The SSP and LPP interventions both included a proficiency instructional component (i.e. drill through repetition/practice of the passage), but the TW intervention did not include this component. Using the IH as a framework, the researchers predicted that the LPP

intervention would be most effective because it contained both the acquisition and fluency components. Overall, all 4 participants showed the greatest increases in reading accuracy in passages over baseline for the LPP intervention in comparison to the other interventions (increases ranged from 8.1% to 22.3%). LPP also lead to the greatest increase in reading fluency rate over baseline, but SPP also increased reading fluency rate for 3 participants.

Chafouleas and colleagues (2004) found that the two participants with high accuracy but low fluency rate levels improved the most in reading rate (words read correct per minute) from the condition which only included practice (i.e., Repeated Reading condition). The findings are consistent with the IH in that intensive practice is predicted to be one of the most effective instructional strategy for students at the proficiency stage of learning (i.e., students who are already accurate and now in need of improving the speed and automaticity of the skill). Parker and Burns (2014) found that student's demonstrated a greater and faster increase in reading rate when using a proficiency stage reading intervention after their accuracy level was improved to 93% using an acquisition stage intervention.

Morgan and Sideridis (2006) used meta-analytic methodology to analyze 30 single-case design studies that implemented fluency interventions with participants with LD or who were at risk for LD. The fluency interventions were categorized as keywords and previewing, listening and repeated readings, goal setting plus performance feedback, contingent reinforcement, goal setting plus feedback and reinforcement, word recognition, and tutoring. The authors found that the goal setting plus performance

feedback and goal setting plus feedback and reinforcements were significantly more effective for increasing words read correct per minute when comparing the growth parameters across interventions. The findings were not surprising when considering the IH conceptual model because the target of the interventions was to increase proficiency by focusing on reading rate, and it would be expected that performance feedback and reinforcement would be effective instructional strategies in addition to meeting a reading rate goal by practicing the story passages more than once. Furthermore, the key word intervention, word recognition intervention and tutoring intervention all resulted in the least amount of growth in correct words per minute and this is likely because these interventions target accuracy and include acquisition level intervention components. Surprisingly, the listening and repeated reading intervention did not result in significant growth in words read correct per minute which does not fit with the IH. Practice is considered an essential instructional component of proficiency level interventions based on the IH and this typically has demonstrated effectiveness in improving student reading fluency rates (Therrien, 2004). However, Morgan and Sideridis (2006) categorized listening passage preview and repeated readings into one intervention type for analysis. These interventions target different stages of reading fluency skills and focus on different types of academic responding which may not result in increasing words read correct per minute but may increase accuracy of word recognition, but accuracy of words was not included as an outcome measure.

Burns, Codding, Boice, and Lukito (2010) meta-analyzed 55 single-case design studies of mathematics interventions focused on improving computational fluency and

found large effect sizes. Specifically, large effect sizes (percent of nonoverlapping data [PAND] = .97, $\phi = .84$) were found for students who participated in the acquisition stage interventions with frustration level skills that focused on the goal of increasing accuracy of correct responding through explicit instruction or modeling (Burns et al., 2010). These participants would be at the acquisition stage of the IH. The findings are consistent with the IH, providing evidence that the students benefitted most from modeling or explicit instruction likely because these components were acquisition stage intervention components.

Using the IH to determine causal mechanisms. Based on the empirical evidence described above, it is arguable that the IH may provide a way to begin understanding the causal mechanisms of reading interventions based on the identified instructional components that fall within the four IH stages. Beginning evidence for the use of the IH as a conceptual model to look at causal mechanisms is demonstrated by considering specific reading interventions and how each one fits within the stages. Table 1 provides examples of reading interventions often used within the field of education. Each of the reading interventions described in Table 1 has demonstrated general effectiveness (to varying degrees) in remediating specific skill deficits and supporting reading competence in general.

The reading interventions were categorized into one of the IH stages by matching the emphasis of a stage with the intervention. That is, interventions primarily focused on building accuracy of a skill were identified at the acquisition stage. For example, sound sorts, word boxes, supported cloze procedure, phrase drill, and listening

passage preview were identified at the acquisition stage because they focus on building accuracy in a reading skill and are designed to support students in being able to consistently perform a skill correctly. Interventions focused on building the performance rate (i.e., speed) beyond accuracy of a skill were identified as proficiency. For example, incremental rehearsal interventions, word building, and repeated reading all primarily focus on building the performance rate at which students recognize words or are able to read connected text. Interventions identified at the generalization stage demonstrated an emphasis in novel stimulus and interventions at the adaption stage demonstrated an emphasis in adapted responses. However, no specific interventions were found at the generalization and adaption stages of the IH. Possible reasons for the lack of interventions at these stages are discussed later in the discussion chapter.

If reading interventions are more effective at various stages of learning, as proposed by Daly et al. (1996), then the instructional components that have been identified as optimal for each phase could be the potential causal mechanisms of those interventions. Table 2 provides the proposed potential causal mechanisms in reading interventions based on the IH stages and the previous empirical research. For example, listening while reading and phrase drill are most closely aligned with the acquisition stage of learning, and recommended instructional strategies for this stage include modeling, demonstration, immediate corrective feedback, and routine drills. Thus researchers could examine these instructional strategies as possible mechanisms for reading interventions at the acquisition stage regardless of the reading skill focus. Another reading intervention example is repeated reading which most closely aligned

Table 1

Examples of Reading Interventions and Proposed Stage of the IH

Intervention	**Description of Intervention**	**General Effectiveness**	**Proposed Stage of IH**
Sound sorts	The student is introduced to sounds by categorizing pictures according to the same beginning and ending sound. The teacher first models the sorting procedure and provides corrective feedback and guidance when the student sorts a card incorrectly.	Sound categorization has generally helped students develop phonemic awareness skills (Bradley & Bryant, 1983; Maslanka & Joseph, 2002)	Acquisition
Word Boxes	The student practices making sounds into words by sliding letter tiles into boxes as they slowly articulate the sounds the letters represent. The instructor may model this procedure, then the child continues with procedure until boxes are slowly faded away. Corrective feedback through modeling and guidance are provided for incorrect responses.	Students receiving word boxes intervention made progress in reading and spelling words in isolation in addition to other contexts (Joseph, 1998/1999). Students performed better on word identification and spelling than a control group (Joseph, 2000b).	Acquisition
Supported Cloze Procedure	The teachers reads a passage jointly with a student. Most commonly the teacher and student read every other word in the passage and then they switch so each word is modeled for and read by the student. This intervention targets accuracy by modeling and providing correct reading of words in a passage.	The intervention has demonstrated effectiveness in improving reading fluency and comprehension (Homan, Klesisu, & Hite, 1993; Kuhn & Stahl, 2003)	Acquisition
Listening Passage Preview	The teacher models fluent reading by reading a passage aloud while the student follows along with their finger and points to each word as it is read. Then, the student reads the passage and receives corrective feedback as needed.	Generally effective in increasing students' reading accuracy and fluency in passages (Daly & Martens, 1994; Rasinski, 1990; Rose & Sherry, 1984)	Acquisition

Phrase Drill	After the student reads the passage, the teacher points to each word that the student misread and models the word for the student. The student reads the word in isolation and within the phrase or sentence where the word is placed. The student rereads the phrase or sentence at least three times.	A phrase drill method was more effective than within isolation tasks. Phrase drill was also superior in context tasks (O'Shea et al., 1984).	Acquisition
Incremental Rehearsal	Flashcard technique that utilizes a high percentage of known items to produce high repetition of items (e.g., letter sounds, words).	Incremental rehearsal has shown effectiveness for letter sounds and words in addition to other skills. The total weight phi coefficient was .65 (95% CI = .39-.87) for combined data (Burns, Zaslofsky, Kanive, & Parker, 2012).	Proficiency
Word Building	Students practice reading sounds within words by using letter cards to build words. When the student successfully builds a word and reads it aloud, the teacher instructs the child to insert, delete, or exchange a specific letter card to transform the word into the next word in the lesson sequence.	Students completing intervention made significantly greater improvements in decoding attempts, phonemic awareness, and passage comprehension than students in control group (McCandliss, Beck, Sandak, & Perfetti, 2003).	Proficiency
Repeated Reading	The student practices reading the same passage aloud multiple times (e.g., three or four) or reads the passage for a predetermined length of time (e.g., 2 or 3 min) multiple times. Repeated reading has different versions that often include modeling the passage, performance feedback, corrective feedback, and a comprehension component.	For meta-analyzed studies on repeated reading, mean fluency effect size increase for non-transfer reading fluency measures was .83 (SE = 0.07) and transfer measures was .50 (SE = 0.06). The mean comprehension effect size increase for non-transfer measures was 0.67 (SE = 0.08) and transfer was .25 (SE = 0.07; Therrien 2004).	Proficiency

with the proficiency phase of learning, and recommended instructional activities for the proficiency phase include repetition through repeated practice of reading stories, performance feedback, and reinforcement regarding speed with which the student completes the task (Burns et al., 2012; Daly et al., 1996). Thus, researchers could examine repetition, performance feedback and reinforcement as potential causal mechanisms for repeated reading.

Figure 1 provides a way to visually conceptualize the proposed conceptual model and how the study of causal mechanisms relates to the overall picture of improving reading outcomes for students. The figure shows the complexity involved in improving student reading outcomes and how studying causal mechanisms in reading interventions rests on understanding theory and synthesizing existing empirical evidence as a starting point. It demonstrates how moderators may fit within reading interventions and outcomes. The overall conceptualization also shows that there may be general pathways, or causal chains, that operate in improving reading competence for students. Figure 2 provides a specific reading skill example of how students may develop reading fluency skills across the stages of learning in the IH with specified reading interventions and possible causal mechanisms.

Synthesis

Theoretical and empirical evidence has consistently supported the utility of the IH in developing interventions for individual student needs depending on his or her IH stage (Ardoin & Daly, 2007; Burns et al., 2010; Chafouleas et al., 2004; Daly & Martens, 1994; Daly et al., 1996; Parker & Burns, 2014; Martens & Eckert, 2007; Morgan &

Table 2

Possible Causal Mechanisms based on Stages of the IH (Haring & Eaton, 1978)

IH Stage	**Potential Causal Mechanisms**
Interventions at acquisition stage	Modeling/demonstration
	Immediate corrective feedback
	Routine Drill
Interventions at proficiency stage	Frequent Opportunities to Respond (OTR)
	Performance feedback
	Reinforcement
Interventions at generalization stage	Discrimination training
	Differentiation training
Interventions at adaption stage	Problem solving
	Simulations

Sideridis, 2006; Szadokierski, 2012). Given this support, the IH can also be used as a conceptual model to begin identifying and studying causal mechanisms of reading interventions based on the identified instructional components that fall within the four IH stages. Beginning evidence for the use of the IH as a conceptual model to look at causal mechanisms is demonstrated by considering specific reading interventions and how each one fits within the stages. Additionally, Burns et al. (2010) demonstrated that the IH provides a useful framework for linking the effective instructional components of mathematic computational interventions to a student's current skill performance stage (i.e., acquisition or proficiency). Yet, the overall research base in reading intervention

research is limited because most studies are single-case design or brief experimental analyses and focus on its use for identifying individual student intervention needs. Researchers and educators have not yet focused on using the IH as a model to study causal mechanisms in reading interventions. The current study seeks to build evidence for the use of the IH as conceptual model to study causal mechanisms by taking a reading intervention (Phrase Drill) identified above in Table 1 and conducting a between-subjects factorial experiment on the identified instructional components that are proposed to function as causal mechanisms.

Conducting Research on Causal Mechanisms

Different methods are available for testing the plausibility of the proposed causal mechanisms at work in reading interventions based on adapting frameworks from the field of psychotherapy research. Kazdin and Nock (2003) laid out criteria based on conditions for establishing causal relation in scientific research that must be met to demonstrate mechanisms (and moderators) in psychotherapy intervention research. The seven criteria may provide a way to study mechanisms by addressing what research designs and statistical approaches best address the criteria. For the purposes of studying mechanisms in reading interventions, I adapted Kazdin and Nock's (2003) criteria. Table 3 provides a description of each criterion in relation to the study of mechanisms for reading interventions.

In considering the criteria described in Table 3, one of the best options for studying causal mechanisms in reading interventions may be through conducting series of experimental studies in which possible mechanisms are manipulated. Spencer, Zanna,

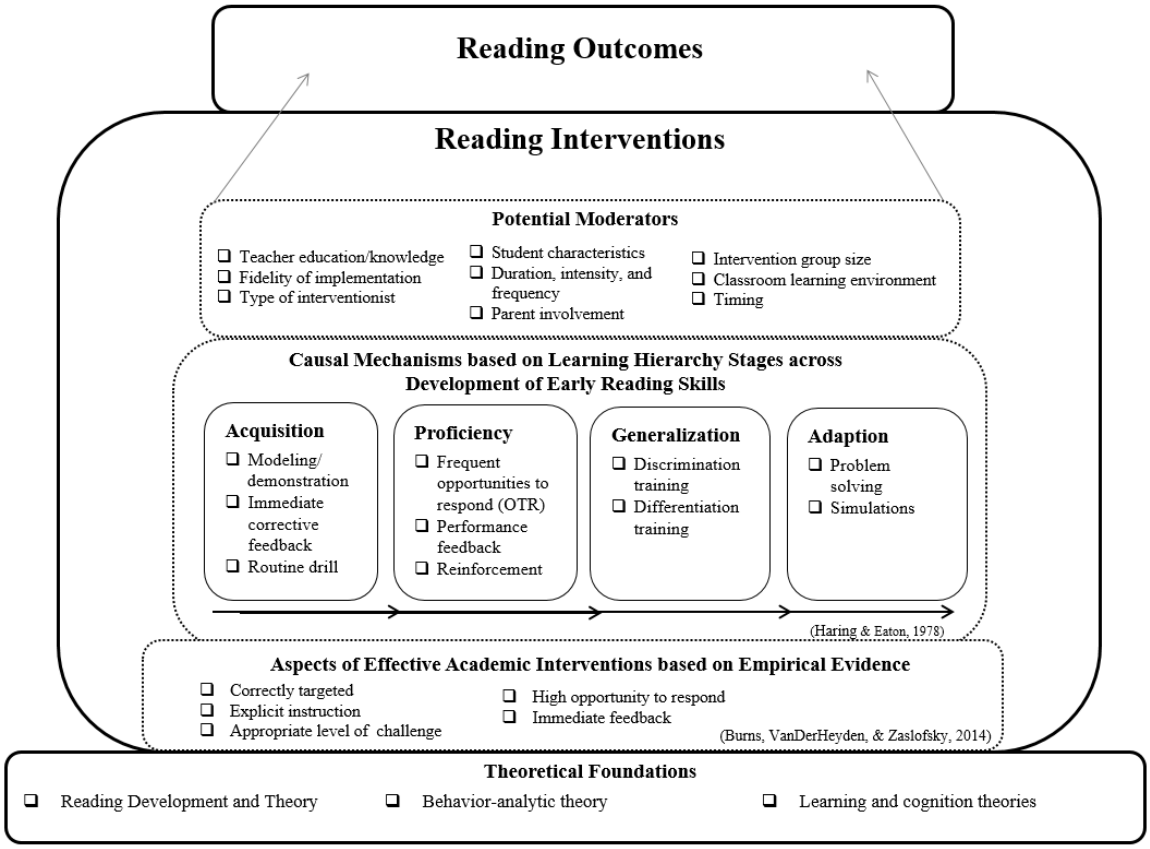


Figure 1. A conceptual framework for understanding how causal mechanisms operate for reading interventions. The pathway flows from theoretical foundations through causal mechanisms that operate across reading interventions based upon the IH stages. Reading interventions may be focused on any specific reading skill. Then, intervention effects flow through possible moderators which lead to reading outcomes.

and Fong (2005) argued that using a series of experimental-causal-chain studies may be optimal if it is easy to manipulate and measure the proposed process. Although they suggest this model for the study of psychological processes which does not readily apply to reading interventions, the proposal to use experiments rather than utilize mediational analyses is useful for studying mechanisms in reading interventions for two reasons. The first reason being that intervention components (the possible mechanisms) are easy to manipulate within experiments. Secondly, it is also arguable that there are fairly simple ways to measure the proposed mechanisms through psychometrically sound reading measures such as curriculum based measurements for reading.

Developing a research line that focuses on reading interventions across each of the four learning stages may be beneficial because causal mechanisms operating in reading interventions are the same within a stage. Thus, a research line may be focused on reading interventions in the acquisition stage, in the proficiency stage, in the generalization stage, and in the adaption stage. For example, studying causal mechanisms in reading interventions within the acquisition stage would identify ways to manipulate the possible causal mechanisms (modeling/demonstration, immediate corrective feedback, and routine drill) and measure the effects of each mechanism on the appropriate reading outcome of interest. Thus, the dependent variable should match the phase of interest (e.g., measuring accuracy in the acquisition phase and speed of responding in the proficiency phase).

Designing a series of studies on the same reading intervention (or studies on different reading interventions in the same IH stage) using the methodology and design

used by Szadokierski and Burns (2008) may be a good approach for reading interventions in comparison to psychotherapy interventions because instructional components are being studied rather than psychological processes as the mechanisms of interest. Thus, a first study may use a group, factorial design that includes two possible mechanisms at the same stage of learning or across stages of learning that are manipulated to create different conditions of the reading intervention. For instance, two factors (modeling and routine drill/repetition) would be manipulated as independent variables across two levels creating four variations of the intervention which are the conditions (high modeling, low or no modeling, high routine drill, and low routine drill). Following studies may then use a similar design but focus on corrective feedback and modeling. Studies across learning stages may compare corrective feedback or modeling in the acquisition stage and repetition or performance feedback in the proficiency stage to confirm what mechanisms are at work based on the stage of learning. Studies at the acquisition and proficiency

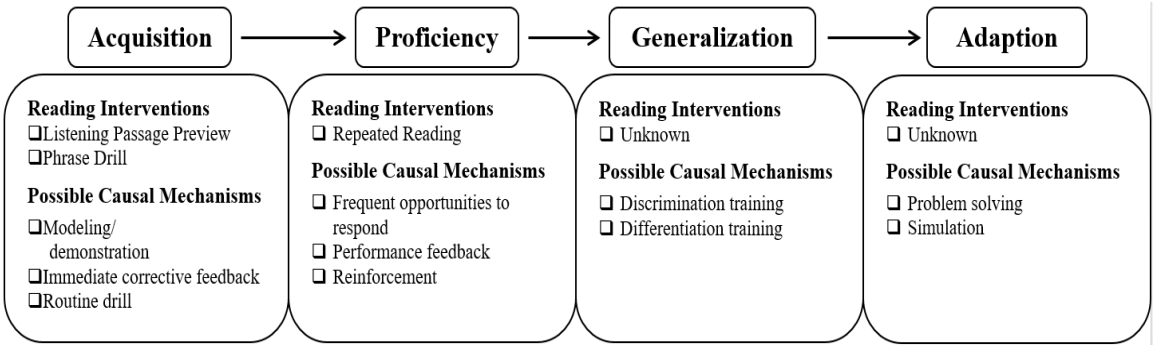


Figure 2. Reading fluency skill development with suitable interventions. The figure provides an example of how students develop reading fluency skills across the stages of learning in the IH with specified reading interventions and possible causal mechanisms.

Table 3.

Criterion for Verifying Causal Mechanisms in Reading Interventions

Criteria	**Description**
Strong association	A strong association must be demonstrated between the reading intervention and the hypothesized causal mechanism and between the causal mechanism and the improved reading outcome.
Specificity	A specific connection between the intervention, proposed causal mechanism, and outcome should be demonstrated. Demonstrating that alternative explanations do not account for the outcome is necessary.
Gradient	The proposed causal mechanism is associated with the greatest amount of change in the reading outcome in comparison to other components.
Experiment	Manipulation of the causal mechanism is associated with a change in the reading outcome of interest. By holding other variables constant across individuals in different experimental conditions, it may be possible to identify the precise causal mechanism in a reading intervention.
Temporal relation	In order to infer causality, the change in the proposed mechanism must precede change in the reading outcome of interest.
Consistency	Replication of results across studies, samples, and conditions provides further evidence for a causal mechanism.
Plausibility and coherence	An explanation in support of how the causal mechanism operates based on theory and grounded in the scientific knowledge base should be provided.

Note. This table is based on Kazdin and Nock (2003)

stages may also consider looking at various forms of drill and repetition because reading interventions across both stages typically include this component to varying degrees. Studies may additionally consider moderator variables as well.

In following the criteria described above, if one of the manipulated variables is a mechanism for the intervention (holding other variables constant), there should be evidence of a causal and temporal relation between the mechanism and outcome variable. Other explanations would not account for the outcome and the proposed mechanism would be associated with the greatest effect in the reading outcome in comparison to the other variables. The results across the series of experiments would lend additional evidence for the factor that operates as a mechanism, and it can then support the conceptual model being used along with being ground in the scientific knowledge base.

Potential Limitations

Within the literature, the reading interventions most often focused on acquisition or proficiency rather than generalization or adaption. One primary reason for this is that struggling readers often lack skills or are not fluent within reading skills (Joseph, 2014), and therefore reading interventions are typically targeted at these two levels. For this reason, no reading interventions within the generalization or adaption stages were outlined, which is consistent with previous research syntheses (Burns, 2004) and may be problematic for the conceptual model being used. One possible solution to this limitation is to develop interventions that focus on the generalization and adaption stages based on reading theory and the available empirical literature. Then, these interventions may be used to test the legitimacy of the proposed causal mechanisms.

Another possibility is that the last two stages operate more closely with the first two stages based on how reading interventions are currently developed. For example, versions of the repeated reading intervention found that students receiving the intervention versus a control group improved reading speed and ability across novel and more difficult reading passages as the intervention was carried out across several weeks (Therrien, Wickstrom, & Jones, 2006). The repeated reading intervention may simultaneously and indirectly promote generalization because the intervention often extends for several weeks using multiple and new passages that in turn support generalization of reading fluency skills (Daly et al., 1996). The multiple and new passages may provide discrimination and differentiation training alongside developing proficiency. Even in this example, however, it is difficult to identify at what point generalization of the skills begins to occur and adaption has yet to be considered. Further research is warranted on the last two stages in the hierarchy.

Another limitation of the proposed model used to test mechanisms is that it may imply that a single or a few mechanisms operate within an intervention and lead to single, linear outcomes. However, it is possible that one single mechanism may support multiple outcomes, similar outcomes may be obtained through multiple pathways, or that relationships among variables are nonlinear (Kazdin, 2007). Combined intervention components may also work together as the causal mechanisms for a reading intervention. Because the state of research on causal mechanisms is limited, the first step may be to focus on more simple causal effects that support the proposed mechanisms. Then future

research can explore the possibilities of more complex causal pathways to better understand the mechanisms at work in reading interventions.

The use of mechanistic thinking has its limitations for studying any phenomena (Norkus, 2005). Although it may be tempting to reduce reading interventions down into smaller and smaller components to identify mechanisms that make them work, this is not always necessary. Identifying mechanisms for reading interventions are most useful when they support theory, close the research-to-practice gap, and result in practical significance in the development of reading interventions that work for students in schools. Overall, mechanistic thinking should be guided by ecological systems thinking and the knowledge that reading acquisition and competence is complex and a multi-faceted process of learning.

Synthesis

Various options can be used to study causal mechanisms. For the study of mechanisms in reading interventions, the strongest option may be through conducting series of experimental studies in which possible mechanisms are manipulated. The methodology and design used by Szadokierski and Burns (2008) may be a good example of how to study possible mechanisms, but they studied one specific intervention. Utilizing this methodology allows the researcher to manipulate the instructional components to parse out which components function as the mechanisms. The use of a series of experimental studies also allows for the testing of a theory or model, such as the one described in this chapter. The current study seeks to not only begin the process of looking at what makes PD work by carrying out an experimental study designed to look

at specific instructional components of PD, but also seeks to lend support to the use of the IH conceptual model for studying causal mechanisms in reading intervention research.

Using the IH Conceptual Model to identify the Causal Mechanisms of Phrase Drill

A significant number of students experience reading fluency difficulties in the elementary grades (Rasinski et al., 2009; Rasinski & Padak, 1998). Reading fluency is often a common skill deficit for students with and without disabilities (Therrien, Gormley, & Kubina, 2006). There remains a considerable need to develop effective and efficient reading fluency interventions for students identified as struggling with reading fluency. Identifying effective and efficient reading fluency interventions will happen through identifying causal mechanisms of these interventions. The current study sought to begin this task by focusing on the PD intervention through the use of the IH conceptual model discussed above. The following section will provide a description of PD, discuss reading fluency as it relates to PD, review the theoretical and empirical support for PD, and then use the conceptual model to identify the causal mechanisms of PD that will be the focus of the experiment carried out in the current study.

Description of Phrase Drill

PD is a reading fluency intervention focused on supporting readers in learning words they do not know by using a specific error correction procedure to increase accuracy of word recognition in the context of connected text (Daly, Chafouleas, & Skinner, 2005; O'Shea, Munson, & O'Shea, 1984). A basic PD intervention involves having the teacher model the correct pronunciation of any words the student misread during their initial read of the designated passage and then the student immediately

repeats the incorrect words back to the teacher. The student then rereads each meaningful phrase or sentence with error corrections up to three times and continues on to following sentences with any errors within the connected text passage.

PD along with other fluency focused reading interventions incorporate many instructional components within the intervention design. These instructional components may be incorporated in varying ways. In reviewing the studies using PD as an intervention, instructional components most often included modeling or prompting, phrase or sentence repetition, and immediate reinforcement. A description of each of these instructional components is provided here.

Modeling. In general, modeling is widely considered a type of corrective feedback in the PD intervention because modeling is used as the error correction procedure. That is, the instructor provides immediate corrective feedback when a student incorrectly reads a word by providing a model of the correct pronunciation of the error word(s). Error words are treated as unlearned words meaning that the student has not yet acquired the word and therefore is not successfully recognizing the word when reading. Errors include substitutions, omissions, mispronunciations, or hesitations for more than three seconds. This corrective feedback may occur right after an error in text or may happen after the student finishes reading the entire passage (Barbetta, Heward, Bradley, & Miller, 1994). Error correction may also only be used for words that carry meaning in the text that the teacher deems important for the reader to practice (Hoffman, 1979; Jenkins & Larsen, 1979; Nelson et al., 2004; Pany et al., 1981).

Other forms of modeling may also be used when a student makes an error, such as providing a student with less support for incorrectly read words by providing a corrective cue or prompt of the error words. This may relate to using a word attack skill process for providing incrementally higher levels of support that begins with having the student try another way to read the word and ending with supplying a correct pronunciation of the word for the student (Hansen & Eaton, 1978). Another option is to provide a student with the first sound of the word read incorrectly to provide an initial prompt that will support the student in sounding the entire word out (Barbetta, Heward, & Bradley, 1993; Espin & Deno, 1989).

Phrase or sentence repetition. This component involves the student rereading the phrase or sentence that had error words (O'Shea et al., 1984). The rereading occurs right after the corrective feedback and modeling of the word occurred. The practice may involve repeating the phrase or sentence one to three times. Repeating a phrase or sentence in the same story passage can be considered routine drill because it offers the student multiple practice opportunities to read the word correctly. It is hypothesized that reading the error words in the context of a meaningful phrase or sentence will promote faster learning of these unknown error words for the student because the student is learning the word in context rather than in isolation (O'Shea et al., 1984).

Immediate reinforcement. While providing the error correction, modeling of words, and repeating phrases or sentences to practice the words, frequent reinforcement in the form of ensuring the student knows they are correctly reading each word is needed. This means that when a student reads a word correctly after the word being supplied by

the teacher, the teacher than acknowledges that the student read the word correctly (Daly et al., 2005). If the student did not read the word correctly, then the teacher would provide the word to them again and ask for the student to say the word before moving on to reading the phrase or sentence.

Reading Fluency and the Phrase Drill Intervention

The primary goal of phrase drill is to improve a student's reading fluency through increasing accuracy of word recognition in connected text which in turn translates to improved reading fluency and overall reading proficiency in reading new materials (Chard, Vaughn, & Tyler, 2002; Martens et al., 2007). Thus, for the current study it is important to consider the definition of reading fluency and how it is empirically measured.

Reading fluency is an essential part of effective reading instruction particularly because it is one of the essential skills that must be developed for proficient reading and comprehension (Fuchs et al., 2001). Its importance was solidified when the National Reading Panel's report (National Institute of Child Health and Human Development [NICHHD], 2000) identified reading fluency as one of five areas of reading instruction and literacy development that should be targeted in early elementary reading instruction. Developing reading fluency skills is particularly important for second and third grade students (Snow, Burns, & Griffin, 1998), but continued research has demonstrated its important for upper elementary, middle school and high school students as well (Rasinski, Rikli, & Johnston, 2009).

Reading fluency is comprised of accurate word recognition, rate of reading, and prosody (Kuhn & Stahl, 2003; Rasinski et al., 2009; O'Connor, White, & Swanson, 2007; NICHHD, 2000). Accuracy in word recognition means that a student is able to recognize and decode words correctly and quickly (Hudson et al., 2005). Reading rate is the ability to read with appropriate speed and fluidity through connected text such that the student has attained automaticity in word recognition. Prosody refers to the use of proper expression during reading. Reading with expression means being able to convey meaning through the appropriate use of rhythmic and tonal aspects of speech such as intonation, stress patterns, duration, and phrasing (Schreiber, 1991; Kuhn, 2004/2005). Some researchers in the field, such as Rasinski (2012), have proposed that fluency is comprised of automaticity and prosody. Automaticity includes the ability to recognize and decode words as well as read words effortlessly or automatically. Then, prosody is said to connect the overall fluency process to comprehension.

Empirical Measurement of Reading Fluency

Various methods have been used to measure the effects of implementing PD with students, such as accuracy of words read in isolation, percentage of words read accurately in connected text (both practiced and novel passages), number of errors in connected text, and number of correct words read per minute (Begeny, Daly, Valleley, 2006; Nelson et al., 2004; O'Shea et al., 1984). A common method used within both experimental studies and educational settings is a reading fluency measure in which students read a story for one minute and the examiner calculates the percent of words read accurately (i.e., word accuracy) and the number of words read correct per minute (i.e., reading rate). Reading

fluency has been proposed as a good indicator and quality measure of overall reading competence, including comprehension, and fits within a strong foundation of theoretical models of development of reading skills (Fuchs et al., 2001). Reading fluency correlated the strongest with a commercial achievement test of reading comprehension in comparison to direct reading comprehension measures, such as question answering, passage recall, and cloze (Fuchs et al., 1988).

A common measure of reading fluency is a curriculum-based measurement of reading (CBM-R) that is systematic, standardized, and designed to measure academic growth in the area of reading (Deno, 1985; Shinn, 2002). The outcome measure is the number of word read correctly per minute which provides a rate for reading fluency. Initially, CBM-R was one type of curriculum-based measure designed to measure individual student performance across time in the area of reading and to evaluate instructional effects (Deno, 1985, 1986, 1989; Deno, Marston, & Tindal, 1985). CBM-R is now commonly used for screening, benchmarking, eligibility and diagnostic decisions, and progress monitoring (Wayman et al., 2007). There is a substantial amount of empirical evidence documenting CBM-R is reliable and valid for screening and benchmarking purposes to determine students who may be at risk of reading problems (Wayman et al., 2007). There is less evidence for using CBM-R for progress monitoring assessment and evaluation (Ardoin et al., 2013), but some evidence suggests CBM-R data are sensitive to change and can be used to monitor a student's skill growth over time (Deno et al., 1985, 1986; Deno, 2002). Overall, CBM-R measures are strongly correlated with reading achievement tests (Ardoin & Christ, 2009), and have shown to be an

adequate indicator of overall ability in the area of reading achievement (Fuchs et al., 2001; Reschly, Busch, Betts, Deno, & Long, 2009).

Within recent years, researchers have focused on creating equivalent passages to create a more reliable measure of student reading growth. Although CBM reading measures are typically used to monitor student growth over time in reading fluency development and as a general outcome measure, it is also possible to use these passages for experimental research of the PD intervention. CBM-R passages work because the skill to be mastered in implementing PD is reading fluency and therefore a reading fluency measure is most appropriate for measuring the effects of the intervention (Daly et al., 1996). Additionally, these passages are often fairly equivalent to one another in comparison to other reading materials available in the educational setting which allows for valid pre-intervention and post-intervention measures (Christ & Ardoin, 2009).

Daly and colleagues (1996) considered what types of academic responding were essential to measure progress at the different stages of the IH. They recommended that a measure of accuracy (such as the percentage of responses that are correct) be used as the key outcome at the acquisition stage of the IH. They also recommended that interventions targeted at the proficiency stage use an accuracy rate or speed measure (such as words read correct per minute). Daly and colleagues (1996) reviewed the research literature to determine the level of empirical support for various treatment components included in reading interventions. Overall, they demonstrated that the treatment components identified in the IH showed the greatest effectiveness for improvement in the identified reading skills when the appropriate type of academic responding was used as the outcome

measure, but not all studies included appropriately targeted measures for the intervention that was implemented. Additionally, Daly et al. (1996) did not conduct a systematic review of the empirical literature and did not include effect size measures. Thus, additional research is needed to support their findings.

The recommendation to match type of academic responding to the IH stage is important to consider for measuring the effects of PD because previous studies conducted on PD or other acquisition level reading fluency interventions have often only included words read correct per minute as the dependent measure which is most appropriate for measuring a proficiency stage intervention such as repeated reading. It is likely that some studies may not provide accurate representations of the effects of the intervention because they did not include the suitable outcome measure. For example, Morgan and Sideridis (2006) categorized listening passage preview (an acquisition level intervention) with repeated reading (proficiency level intervention) and only used words read correct per minute as their outcome measure although an accuracy measure (percent of words read correct) would be more suitable to identify effectiveness for listening passage preview.

Given previous research studies found that PD had increased word recognition accuracy and reading rate for participants in the studies (Alber-Morgan, Ramp, Anderson, & Martin, 2007; Daly, Dool, Hintze, & Martens, 1998; Fienup et al., 2015; Malanga, 2003) and that both accuracy and rate are essential features of fluent readers, both of the measures were included as the dependent variables in the current study. However, it is also noted that PD will likely improve accuracy of responding the most in comparison to the control condition while reading accuracy rate may not improve much or any.

Theoretical Support for PD

Varying theoretical frameworks have been established over the past forty years to explain the development of reading proficiency overall and more specifically the role fluency in reading proficiency (Chard, Ketterlin-Geller, Baker, & Apichatabutra, 2009). Theories of cognition and learning apply to learning to read and many of these theories are tied to the development of PD as an intervention for reading fluency (Logan, 1988; Perfetti, 1985; Stanovich, 1990).

Perfetti and colleagues (Perfetti & Lesgold, 1979; Perfetti & Roth, 1981) verbal efficiency theory is based on information-processing theory and posits lower level processes such as word identification have to reach a certain threshold level before high level processes such as comprehension can occur simultaneously during reading. Therefore, students must reach a certain level of fluent processing in reading in order to efficiently perform the task of comprehending meaning from text. The theory assumes that resource demands can be reduced through practice and learning because automaticity of lower level processes is built. This theory lends support for PD because PD provides direct support in building decoding and fluency processing skills (i.e., accuracy and fluent word recognition) and accuracy and fluent word recognition allow the reader to free attention from these lower level processing which in turn supports readers in attaining the threshold necessary for comprehension processing. Although lower level processing skills include more skills beyond fluent decoding, there is significant evidence suggesting fluent decoding skills are a prerequisite for reading comprehension and

therefore accurate and automatic decoding are significant factors that likely lead to improved reading comprehension (Torgesen, 1986).

PD is also tied to LaBerge and Samuel's (1974) automatic information processing theory in that PD provides repeated practice of words and sentences and often repeated practice of a passage because it is often incorporated into the repeated reading intervention. The theory postulates that the ability to fluently read is a complex skill that involves coordinating many component processes in a short time frame (Fuchs et al., 2001). Essentially, a fluent reader is able to decode text automatically such that they do not need to focus much attention on the lower level processes, like decoding and word recognition, necessary for fluent reading and therefore have attention free for higher level processes, such as syntactic and semantic processing (Samuels, 1979). More specifically in the development of fluent reading skills, automaticity in processing occurs at the word unit, then processing units into recognizable words, and then connecting the words together when reading passages, which then leads to the ability to simultaneously invest effort in comprehension tasks (Chard et al., 2002).

A reader struggling with fluency must focus his or her attention on aspects of decoding and word recognition components and therefore has little attention and cognitive resources available for higher level processes such as comprehension. According to LaBerge and Samuel's (1974) theory, fluency problems occur because readers are poor or slow at decoding, leading to a reduced amount of short-term memory available to comprehend the meaning of the text (Rashotte & Torgesen, 1985; Therrien & Kubina, 2007). By investing time in reading practice through the repeated reading

method, nonfluent readers are provided many exposures to the same words and are able to build automatic decoding skills and word recognition skills. This in turn builds fluency skills and therefore frees up attention to focus on the meaning of the text.

PD may also be explained through feature transfer theory (Finn, 1979). Finn (1979) proposed that individual words carry a variety of markers which provide information about the identity of the word. This information includes word class, meaning and location within a sentence. As words are presented in context these features transfer to the surrounding words which provide cues to their identity. For example, in PD, each word that is contained in a phrase or full sentence provides information about itself but also about the identity of other words in the phrase or sentence. Students are not only rehearsing the recognition of the error words that are corrected but also the overall recognition of the context surrounding the error words with the other words in the phrase. Thus, recognition of other words in the phrase or sentence may increase the probability of recognizing the targeted error word. This theory may lend support for why PD is more effective than other forms of word drill in isolation because no association between error word and other words is provided (O'Shea et al., 1984).

PD is also based on the direct instruction model of learning how to read because of its emphasis on individual word recognition and immediate corrective feedback (Carnine, 1980; Carnine, Silbert, & Kameenui, 1990). This instruction model states that processing begins at the individual sound level and continues to word recognition and then comprehension. Because there is a close connection between word recognition and comprehension, error correction is essential to instruction because correcting words

means there will be an increase in word recognition accuracy. Then higher levels of word recognition accuracy means comprehension becomes possible.

Empirical Support for PD

A considerable amount of empirical evidence for the use of error correction procedures to improve overall word recognition accuracy leading to increased reading fluency and proficient reading in general has been built through research over the past fifty years (Jenkins & Larson, 1979; Jenkins, Larson, & Fleisher, 1983; Rose, McEntire, & Dowdy, 1982; Rosenberg, 1986; Singh, 1990). For example, correcting errors words is more effective for increasing word accuracy and reading fluency than ignoring errors (Sindelar, 1987). Thus, various error correction procedures have been studied, such as word supply, phonic analysis, word drill, word repeat, and phrase drill (Jenkins et al., 1983; Wallace, 2013). PD is an extension of the initial work of error correction drill procedures (Jenkins & Larson, 1979) through initial studies conducted by O'Shea and colleagues (1984) in which they compared the phrase drill procedure with the more common approach of individual error word drill procedures and word supply. They found that PD was a superior error correction strategy than the other two strategies for accurate recognition of words in context. This increased word accuracy likely occurred because PD provides practice in correctly reading words in connected text rather than in isolation through word list practice.

Other studies have also demonstrated that error correction in context is more effective than error correction in isolation (Glynn, 1985; Singh & Singh, 1986). One study found that a sentence repeat procedure was more effective than the use of word

supply alone (Singh, 1990). Evidence also exists for the use of immediate whole word correction over provision of immediate phonetic prompts to increase reading accuracy (Barbetta et al., 1994).

In studies conducted more recently, PD is often incorporated into listening passage preview or repeated reading interventions because it offers an effective error correction strategy to provide a more comprehensive reading fluency intervention package. Researchers using brief experimental analyses methodology or case study designs found that incorporating PD into their reading fluency intervention decreased the number of errors per minute for students in comparison to the repeated reading only intervention conditions (Nelson et al., 2004; Begeny et al., 2006; Jones et al., 2009), but the addition of PD did not have a considerable effect on the overall correct words per minute. However, other studies did find a general increase in reading rate in addition to decreased errors when including PD (Alber-Morgan et al., 2007; Daly et al., 1998; Fienup et al., 2015; Malanga, 2003).

Including a corrective feedback component during reading fluency instruction has been found to enhance both word recognition accuracy and comprehension (Heubusch & Llody, 1998; McCoy & Pany, 1986; Pany & McCoy, 1988; Therrien, 2004). Meta-analytic research found a large mean fluency effect size (1.37) when adults provided the corrective feedback (Therrien, 2004). Therrien (2004) recommends the addition of a corrective feedback component to reading fluency interventions because it can improve overall reading fluency and comprehension. Heubusch and colleague (1998) also recommended the inclusion of corrective feedback during oral reading practice after

comparing 11 studies that used corrective feedback versus 13 studies that had no feedback.

Synthesis of Empirical Support

Overall, PD is an effective intervention for supporting students in the acquisition of unlearned words in the context of reading connected text and building oral reading fluency skills (Daly et al., 2005). Several studies have demonstrated PD is an effective intervention for reducing the number of errors made in reading passages and thereby increasing the overall rate of accurate word recognition. PD has been effective for both students with or without disabilities (i.e., learning disabilities or cognitive disabilities) and students in elementary and middle school who are behind grade level in reading or identified as needing additional support in building reading fluency skills (Jones & Wickstrom, 2002; Pany & McCoy, 1988; Singh, Winton, & Singh, 1985). There is also growing support for PD improving overall reading fluency and comprehension. However, the majority of these studies used single case design or brief experimental analysis methodology and no comprehensive review of PD has been conducted. Continued research with randomized control trials and between-subject experimental designs is needed in order to confirm PD as an empirically-supported and evidence-based intervention. Because of the limited empirical support of PD, the current study included a control condition to establish effectiveness of PD in addition to examining causal mechanisms of the intervention. Although additional research is needed to support the effectiveness of PD, researchers have yet to examine the causal mechanisms of the PD intervention which is also an essential part of building the evidence because we do not

know why PD works. Studying causal mechanisms can provide specific evidence for understanding what instructional components make PD effective.

Summary and Research Questions

Given that PD has demonstrated effectiveness at increasing reading fluency skills, the next step is to identify its causal mechanisms. Much like other reading interventions, researchers have not yet focused on breaking down PD in a way that looks at its instructional components to identify what makes it work. The current study uses the IH conceptual model discussed above to identify what instructional components should be studied to identify the causal mechanisms at play. Based on the IH conceptual model, acquisition level strategies that could function as causal mechanisms include corrective feedback, modeling or demonstration, and routine drill (such as sentence repetition). The current study therefore chose to focus on parsing out the effects of modeling and sentence repetition in order to examine what makes PD work. The two identified instructional components used in PD were used to create intervention conditions by separating the two components into two levels (low and high conditions). A control condition was also incorporated in the design of the study. The following research questions guided the study:

1. What are the differences in accuracy and rate of words read correct per minute between the final readings of students in the PD conditions and those in the control condition?
2. What differences exist in students' accuracy of words read on the final read of the story passage based on the modeling component in the phrase drill intervention?

3. What differences exist in students' rate of words read correct per minute on the final read of the story passage based on the modeling component in the phrase drill intervention?
4. What differences exist in students' accuracy of words read on the final read of the story passage based on the repetition component in the phrase drill intervention?
5. What differences exist in students' rate of words read correct per minute on the final read of the story passage based on the repetition component in the phrase drill intervention?
6. To what extent does an interaction occur between modeling and repetition components of the phrase drill intervention in effecting the accuracy of words read on the final read of the story passage for students?
7. To what extent does an interaction occur between modeling and repetition components of the phrase drill intervention in effecting the words read correct per minute on the final read of the story passage for students?

Based on the proposed Instructional Hierarchy conceptual model and the relevant empirical findings discussed above, the following results were expected for the research questions:

1. I hypothesize that each of the four experimental conditions will be significantly different than the control condition such that all conditions, on average, will have increased the accuracy of words read for the participants in comparison to the control condition participants. I hypothesize that all of the experimental conditions will not be significantly different than the control condition such that

all conditions, on average, will have similar words read correct per minute for the participants in comparison to the control condition participants.

2. I hypothesize that a high level of modeling (i.e., the modeling condition) within the PD intervention, regardless of low or high sentence repetition, will lead to a significant increase in accuracy on the final read for participants compared to the low level of modeling (i.e., sound prompt condition) within the PD intervention.
3. I hypothesize that a high level of modeling within the PD intervention, regardless of low or high repetition, will not result in a significant difference in words read correct per minute (i.e., proficiency) on the final read for students compared to the low level of modeling.
4. I hypothesize that a high level of repetition within the PD intervention, regardless of low or high modeling, will not result in a significant difference in accuracy on the final read for students compared to the low level of repetition.
5. I hypothesize that a high level of sentence repetition within the PD intervention, regardless of low or high modeling, would not result in a significant difference in the rate of words read correct on the final read compared to the low level of sentence repetition.
6. I hypothesize that there will be not be a significant interaction effect between modeling and repetition for accuracy of words read on the final read of the story passage.

7. I hypothesize that there will not be a significant interaction effect between modeling and repetition for rate of words read correct on the final read of the story passage.

CHAPTER 3: METHOD

Setting and Participants

The study was completed during spring 2014-2015 after receiving approval from the University of Minnesota Institutional Review Board and informed consent from parents and assent from participants. Two school districts agreed to support the principal investigator's research study. Principal's at the elementary schools in the two districts then agreed to participate and second grade students in their schools were identified based on eligibility criteria and consent to participate in the study. English language learners and students with disabilities were included if they met the all eligibility criteria The principal investigator and several research assistants collected screening and posttest data along with implementing the intervention session.

Setting

All participating students were enrolled in either an urban or suburban public school district in the upper Midwestern United States. A total of six elementary schools participated in the study (five elementary schools from the urban school district and one elementary school from the suburban school district). A total of 2750 students were enrolled in the five schools from the urban school district with 41% of whom identified as White (not of Hispanic origin), 31.9% identified as Black (not of Hispanic origin), 15.9% identified as Hispanic, 9.9% identified as Asian/Pacific Islander, and 1.3% identified as American Indian/Alaskan Native. Additionally, 17.6% of the student population was receiving English Learner services, 10.1% received special education services and supports, and 52.4% received a free or reduced priced lunch.

The elementary school from the suburban school district served 420 students, 89% of whom identified as White (not of Hispanic origin), 2.6% identified as Black (not of Hispanic origin), 3.8% identified as Hispanic, 3.3% identified as Asian/Pacific Islander, and 1.2% identified as American Indian/Alaskan Native. Additionally, 2.9% of the student population was receiving English Learner services, 16.9% received special education services and supports, and 39.3% received a free or reduced priced lunch.

Participants

Based upon prior research and a power analysis (G*Power; Faul, Erdfelder, Lang, & Buchner, 2007), with an effect size of $f = .25$ (Cohen, 1988), the sample size needed to find a medium effect was approximately 140 participants. Students were eligible to participate in the current study if they were identified as below benchmark based upon two criteria. First, the student was currently enrolled in the second grade. Second, a student scored at the 50^{th} percentile or lower on the fall 2014 or winter 2015 district-administered reading screener. This initial criterion was established to identify participants who likely would benefit from receiving a phrase drill intervention because they may be struggling to read grade-level texts proficiently. A wide criterion was initially set to identify a greater number of participants because of the high number of student participants needed for the study. These participants then needed to meet more specific criteria that would be completed on the day they participated in the study and are described below.

Based on the initial eligibility criteria, 146 second grade students (64 female and 82 male) were identified and recruited to participate. Of this overall sample of

participants, 56% percent were males. Ten percent of participants identified as Asian/Pacific Islander, 34% identified as Black (not of Hispanic origin), 22% identified Hispanic, 29% identified as White (not of Hispanic origin), and 5% identified as multi-racial. Ten percent of the participants received special education supports or services. Twenty-eight percent of participants received English learner services.

After the participants met initial criteria, there were then additional eligibility criteria requirements that were examined on the day of the study using screening measures. The additional criteria were implemented to confirm participants were likely in need of an acquisition-level reading fluency intervention. The letter-identification subtest of the Woodcock-Johnson III Tests of Achievement (Woodcock, McGrew, & Mather, 2001) was used as a screening measure of the participants' decoding skills. Students who scored at the 10^{th} percentile or lower on the subtest were excluded from the study and analyses because it was determined that these students were likely still acquiring word recognition skills and were in need of a phonics level intervention and therefore did not fit criteria for participating in the phrase drill intervention study.

Second, students were screened using a second-grade curriculum-based measure for reading (CBM-R) provided by researchers at FastBridge Learning (Christ et al., 2014). The participants needed to score a word accuracy (using percent of words read correct) on the CBM-R passage between 65% and 93%. Students above or below in word accuracy were excluded. Students within this range of word accuracy are likely in need of an acquisition-level reading intervention that focuses on building their ability to accurately and fluently read connected text (Daly et al., 1996). Students reading with a

word accuracy of 65% or lower were excluded from the study because they were likely developing a more foundational skill such as phonics and therefore the phrase drill intervention would not be properly targeted at their skill development level. Students reading with 93% accuracy or higher likely had already acquired basic reading fluency skills such that they attained an appropriate level of accuracy in their reading fluency skills and therefore the intervention would also not be appropriately targeted at their skill level needs (Parker & Burns, 2014).

With these additional criteria, 31 students were excluded from the study and data analyses. An additional 4 students did not complete the entire intervention session because they were absent or opted to stop completion of the study. Therefore, a total of 111 second grade students participated in the full study and were included in analyses. Given the lower number of participants than anticipated based on the power analysis, it is possible with lower statistical power there is a reduced chance of detecting a true effect. However, there are few research studies that have focused on PD and the ones that have included fewer participants found substantial effect sizes.

Materials and Measures

Reading Passage

For screening, assessment, and intervention purposes, a second grade oral reading fluency passage was identified from a curriculum-based measurement for reading (CBM-R) passage set developed by Fast Bridge Learning (Christ et al., 2014). The passage used was a part of the original passage-set development. The process of developing the passage sets was systematic and based on existing research and theory of oral reading

fluency measurement and reading development. Passage development followed a specific process that considered text difficulty that considered reading comprehension, text type, paragraph and sentence structure, word and language usage, and cohesion as criteria. All passages follow a narrative structure (i.e., goal-action/attempt-outcome), and are focused on events that students were likely exposed to throughout their early development. Christ and colleagues field tested the passage sets to minimize variance due to instrumentation of passages and to optimize the reliability and precision when used for progress monitoring purposes. The passage sets for CBM-R therefore have strong psychometric properties.

The CBM-R passage used for this study contained 242 words. The same second grade-level passage was used for screening purposes in addition to being used for intervention and posttest assessment purposes. The first read of the passage was used for screening purposes and the second and final read of the passage was used for posttest assessment purposes. The decision was made to only use one passage in order to reduce time needed to spend with each individual student to reduce the level of frustration that may be experience by the participants because they would be reading a story within their frustration level (< 93%; Gickling & Thompson, 1985).

Standard protocol per CBM-R administration was used for administering the oral reading fluency passage with three exceptions. Because the intervention included conditions with changing levels of modeling in regard to corrective feedback, participants were not told they would be provided with a word if they came to a word they did not know. Instead, the interventionist directed the participant to go on to the next word by

saying, “try the next word.” Standard protocol requires the administrator of a CBM-R passage for FastBridge Learning to provide a word to the student if they are not able to say the word within 3 seconds. Although standardization procedures for this were not followed, the scoring of the assessment remained the same as the word that a participant did not know counted as one error.

The second difference in standard protocol was that the participant was required to read the entire passage rather than read for 1 minute. This was necessary in order to complete the intervention procedures. Rate of words read correct was then found by finding the number of words read correct by dividing total words read correct by number of minutes they took to read the entire passage.

The third difference in standard administration was that participants were redirected to the correct line in the passage of the story if they accidentally skipped a line while reading. This was necessary in order to proceed with following protocol for the intervention procedures. Because the intervention is focused on providing corrective feedback through modeling, the participants needed to read all words the first time reading through the passage to be able to then follow intervention procedures and know which words were read correctly or incorrectly.

All other CBM-R administration protocol remained the same. For example, words counted as correct were words pronounced correctly in their appropriate place within three seconds and self-corrected errors were counted as correct words. Mispronunciations, omitted words, substitutions, and words not read within 3 seconds

were counted as incorrect. For further information about administration and scoring the CBM-R technical manual (see Christ et al., 2014) can be consulted.

Screening Measures

The first screening measure assessed participants' decoding skills by using the letter-identification subtest of the Woodcock-Johnson III Tests of Achievement (WJ-III; Woodcock, McGrew, & Mather, 2001). The second screening measured assessed student's word accuracy level. Students were screened using a second-grade CBM-R passage provided by researchers at FastBridge Learning (Christ et al., 2014). The participants needed to score a word accuracy (using percent of words read correct) on the first read of the CBM-R passage between 65% and 93%. This screening measure was also used as a pre-test measure in order to ensure all intervention condition groups had similar oral reading fluency skills for data analyses.

Dependent Measures

Two dependent measures were used for this study. Both of these measures were post-intervention. The first dependent measure was accuracy of words read on the final read of the CBM-R passage used for the intervention. The data consisted of the percentage of words read correctly, which was computed by dividing the number of words read correctly by the total number of words and multiplying by 100. Words were counted as correct if they were read within 3 seconds or less. The use of accuracy of words read is an established measure based on models of curriculum-based assessment for reading (Burns et al., 2000; Gickling & Thompson, 1985). Burns and colleagues (2000) evaluated the psychometric properties of using instructional level through

curriculum-based assessment and found that curriculum-based assessment could be used to identify instructional level for second, third, and fourth grade students.

The second dependent measure was rate of words read correct per minute (WRCPM) on the final read of the CBM-R passage used for the intervention. WRCPM was found by dividing the total correct number of words read by number of minutes it took the participant to read the entire passage. WRCPM is a widely accepted measure because of its strong psychometric properties in its use as a curriculum based measure for reading (Christ et al., 2014; Fuchs et al., 2001). The passage used was a part of the original passage-set development. Based on the normative information for CMBReading for the winter benchmark, second grade students reading 97 WRCPM fell at the 50th percentile, students reading 84 words fell at the 35th percentile, students reading 61 words fell at the 15th percentile, and students reading 39 words fell at the 5th percentile (Christ et al., 2014). Second grade students scoring at the 15th percentile or lower were considered to be at high risk for reading difficulties.

Description of Intervention and Conditions

The two independent variables were modeling and sentence repetition. Each of these independent variables had two levels. A control condition was also included. The modeling variable included low and high levels of modeling by providing the student with the first sound of incorrectly read words and a model of the whole word and the repetition variable included low and high levels of sentence repetition in which the participant re-reads sentences in the story for each sentence that he or she had one or more errors. Thus, participants were randomly assigned to one of the four PD

intervention conditions or the control condition. Each participant received one intervention session of one of the five conditions

Intervention Conditions

In previous research studies, the PD intervention required students to read a text while the interventionist highlighted any error words. When the student finished reading the story, the interventionist pointed out which words were read incorrectly by sentence or phrases within the sentence beginning from the top of the text and then modeled the correct pronunciation of any error words to the student. The student then said the word(s) correctly and read the sentence or phrase containing the error word aloud, and may read the sentence multiple times. If a sentence contained more than one error word, the interventionist modeled all error words in the sentence first and had the student read the sentence.

For the current study, the PD intervention required variations in order to focus on understanding which instructional component(s) make the intervention work (i.e., to identify the likely causal mechanism). Therefore, the modeling procedures and number of times a student read a sentence after the modeling procedure is specified in the descriptions of the conditions below.

Besides what is specified below, all instructional conditions included or excluded any additional components that may often otherwise be used in the intervention to control for possible variables that may impact participants' reading performance. For example, any prompting or feedback used within the intervention was minimal and remained the same across all instructional conditions. Participants were not provided with the correct

pronunciation of words during the first read of the passage which is typically the case during CBM-R administration. Participants also read the same passage regardless of instructional condition, no specific reinforcement or goals were shared with the participants, and participants were not cued to read for accuracy or fluency. Also, corrective feedback remained constant for all four intervention conditions such that all participants were informed of all words that they read incorrectly in the same manner across interventions by pointing out the word to the participant and then following the sound prompt or modeling procedure.

Overall, what differed between the conditions was the level of modeling and sentence repetition that was provided. Students were either provided the first sound of an incorrectly read word (Sound Prompt) or the pronunciation of an incorrectly read word was modeled (Word Modeling), and the student read each sentence in the stories with incorrectly read word(s) either one time (Low Repetition) or three times (High Repetition). Table 4 provides basic information for each of the intervention conditions (excluding control condition) by independent variable and level (see Appendix A for specific intervention protocols for each condition) and all conditions are described below.

Control Condition

The participant was directed by the interventionist to read the story passage all the way to the end. Then, the participant was directed to go back and read the story passage one more time all the way to the end. There was no modeling or error correction procedure used in the control condition and therefore no sentence repetition. Participants in the control condition will participate in the screening and assessment activities only.

Sound Prompt/Low Repetition Condition

The interventionist directed the participant to read the passage. After completing the first read of the passage, the interventionist began the correction procedures from the beginning of the story. In this condition, the interventionist pointed to the words that were read incorrectly by sentence and helped the participant decode the words by providing the first sound (e.g., this word begins with the /_/ sound. What's this word?). Providing only the first sound was considered to be a low level of modeling. Then the participant was asked to try to sound out the word. Participants were provided with confirmation when they read the word correctly (e.g., "That's right. Now read this sentence" or "That's right. Now let's go to the next word in this sentence we need to correct"). The first sound was only provided three times. If the student was not able to sound out and read the word correctly from the first sound after three times of prompting, the interventionist moved on to any other incorrect words in the sentence and said, "Try reading this sentence" OR "Do your best to sound out all the words as you read." This modeling and error correction procedure was followed throughout the story until all error words were corrected and sentences were read within the story. In addition to the modeling procedure, participants were asked to read each sentence with errors one additional time after the modeling/error correction procedure was completed for that sentence. This procedure was considered to be the low level of sentence repetition. Sentences with no errors were not read during this procedure. After completing the procedure to the end of the story, the participant was then asked to read the story one more time.

Sound Prompt/High Repetition Condition

The interventionist directed the participant to read the passage. After completing the first read of the passage, the interventionist began the correction procedures from the beginning of the story. In this condition, the interventionist pointed to the words that were read incorrectly by sentence and helped the participant decode the words by providing the first sound (e.g., "This word begins with the /_/ sound. What's this word?"). Providing only the first sound was considered to be a low level of modeling. Then the participant was asked to try to sound out the word. Participants were provided with confirmation when they read the word correctly (e.g., "That's right. Now read this sentence" or "That's right. Now let's go to the next word in this sentence we need to correct"). The first sound was only provided three times. If the student was not able to sound out and read the word correctly from the first sound after three times, the interventionist moved on to any other incorrect words in the sentence and said, "Try reading this sentence" OR "Do your best to sound out all the words as you read." This modeling and error correction procedure was followed throughout the story until all error words were corrected and sentences were read within the story. In addition to the modeling/corrective procedure, participants were asked to read each sentence with errors three times after the modeling/error correction procedure was completed for that sentence. This procedure was considered to be the high level of sentence repetition. Sentences with no errors were not read during the procedure. After completing the procedure to the end of the story, the participant was then asked to read the story one more time.

Word Modeling/Low Repetition Condition

The interventionist directed the participant to read the passage. After completing the first read of the passage, the interventionist began the correction procedures from the beginning of the story. In this condition, the interventionist pointed to the words that were read incorrectly by sentence and modeled the correct pronunciation of the word for the participant (e.g., "this word is 'cat,' what's this word?"). Providing the correct pronunciation of all incorrectly read words in the story was considered to be the high level of modeling. After modeling the word, the participant was then asked to say the word. Participants were provided with confirmation when they read the word correctly (e.g., "That's right. Now read this sentence" or "That's right. Now let's go to the next word in this sentence we need to correct"). The interventionist modeled the word up to three times if needed (e.g., "No, this word is 'cat,' what's this word?"). If the student was not able to say the word correctly after three times of modeling the word, the interventionist moved on to any other incorrect words in the sentence or asked the participant to read the sentence (i.e., "Try reading this sentence"). This modeling and error correction procedure was followed throughout the story until all error words were corrected and sentences were read within the story. In addition to the modeling procedure, participants were asked to read each sentence with errors one additional time after the modeling/error correction procedure was completed for that sentence. This procedure was considered to be the low level of sentence repetition. Sentences with no errors were not read during this procedure. After completing the procedure to the end of the story, the participant was then asked to read the story one more time.

Word Modeling/High Repetition Condition

The interventionist directed the participant to read the passage. After completing the first read of the passage, the interventionist began the correction procedures from the beginning of the story. In this condition, the interventionist pointed to the words that were read incorrectly by sentence and modeled the correct pronunciation of the word for the participant (e.g., "this word is 'cat,' what's this word?"). Providing the correct pronunciation of all incorrectly read words in the story was considered to be the high level of modeling. After modeling the word, the participant was then asked to say the word. Participants were provided with confirmation when they read the word correctly (e.g., "That's right. Now read this sentence" or "That's right. Now let's go to the next word in this sentence we need to correct"). The interventionist modeled the word up to three times if needed (e.g., "No, this word is 'cat,' what's this word?"). If the student was not able to say the word correctly after three times of modeling the word, the interventionist moved on to any other incorrect words in the sentence or asked the participant to read the sentence (i.e., "Try reading this sentence"). This modeling and error correction procedure was followed throughout the story until all error words were corrected and sentences were read within the story. In addition to the modeling/corrective procedure, participants were asked to read each sentence with errors three times after the modeling/error correction procedure was completed for that sentence. This procedure was considered to be the high level of sentence repetition. Sentences with no errors were not read during the procedure. After completing the procedure to the end of the story, the participant was then asked to read the story one more time.

Interventionists and Assessors

The interventionists and assessors were nine graduate students (8 female, 1 male) from an Educational Psychology graduate program. All graduate students had previous training in administering CBM-R assessments. The principal investigator trained all interventionists in implementation on the intervention prior to completing intervention sessions with participants. Interventionists were required to demonstrate 100% accuracy with the intervention and assessment procedures based on the fidelity checklist which was used to assess implementation fidelity for the study (see Appendix B for fidelity checklists). The principal investigator provided directions and protocols for all

Table 4

Descriptions of the Independent Variables by Level

Modeling (IV)	Sentence Repetition (IV)	
	Low Repetition	High Repetition
Sound Prompt	• Interventionist points to the words that were read incorrectly by sentence and helps student decode word by providing first sound. • Then, the student reads the sentence one time.	• Interventionist points to the words that were read incorrectly by sentence and helps student decode word by providing first sound. • Then, the student reads the sentence three times.
Word Modeling	• Interventionist models all words read incorrectly by sentence and student repeats word correctly. • Then, the student reads the sentence one time.	• Interventionist models all words read incorrectly by sentence and student repeats word correctly. • Then, the student reads the sentence three times.

interventionists to review in advance and then follow as they conducted the intervention and assessed participants. The principal investigator met with the interventionists prior to implementation to review the protocols and answer additional questions. Then, the interventionists observed the principal investigator carry out the intervention and complete the assessments with one or more participants. Interventionists could observe intervention sessions until they felt confident in conducting the intervention. During the first intervention session, each interventionists was then observed and provided feedback. If needed, the observer supported the interventionist to ensure fidelity of implementation during the intervention session (e.g., provided reminders of how to give the corrective feedback or modeling).

Procedure

Potential participants were identified by school administrators and teachers and then consent forms were distributed to participants to take home to parent or guardian. Consent forms were provided in both English and Spanish when requested by the school. Along with the principal investigator, fellow graduate students were recruited to gather data and implement the intervention sessions with participants.

On day of participation, participants were randomly assigned to one of the five conditions. The intervention session for each participant was conducted individually in a quiet pull-out setting within the participant's school. Participation in the study required only one intervention session that was completed on one day. If necessary because of time constraints (i.e., school day ending or lunch time), participants were allowed to complete the intervention in two sessions which occurred on two separate days. In each

of the cases when an additional day was required, the interventionist ended the first day at an appropriate stopping point such as after the first read of the story passage and then the intervention procedures took place on the second and final day of the intervention session. Eleven students completed the intervention session split between 2 days. Intervention sessions averaged 20 minutes per participant (ranging from 8 to 57 minutes).

At the beginning of the session, the participant was read an assent form and the interventionist confirmed that the participant wanted to participate. Participants were allowed to end participation in the study at any time and would still receive the small incentive. Next, the participant listened to instructions (see Appendix C for complete instructions), the interventionist completed the screening assessment, and then participated in the randomly assigned intervention condition by completing the intervention session per procedure protocol which was specified for each of the five different conditions. In addition to timing participants read of the first and final reads of the story passage, the intervention sessions were timed by the interventionist. Timing of the session began when the reading of the grade-level passage being used for the intervention and ended with the completion of the intervention implementation with the final reading of the grade-level passage. Administration of WJ-III subtest and sharing directions of the study with participants were not included in the intervention time. At the end of the session, each participant was thanked and provided with a small incentive for participating (i.e., pencil).

Research Design

The study used a two-by-two factorial, between-subjects experimental design with a control condition (see Figure 3). Participants were randomly assigned to one of the four PD intervention conditions or control condition. Each participant received one session of one of the conditions. The two independent variables were modeling and sentence repetition. Participants' reading performance data was collected before completing the intervention condition and then directly after the implementation of the intervention. That is, the first read of the passage was used as the screening measure and the final read of the same passage after the intervention condition was completed was used for the posttest measures. The dependent variables were the posttest measures of accuracy and reading fluency rate.

R	$O_{Screening}$	$X_{Control\ Condition}$	$O_{Posttest}$
R	$O_{Screening}$	$X_{Sound\ Prompt/Low\ Repetition\ Condition}$	$O_{Posttest}$
R	$O_{Screening}$	$X_{Sound\ Prompt/High\ Repetition\ Condition}$	$O_{Posttest}$
R	$O_{Screening}$	$X_{Word\ Modeling/Low\ Repetition\ Condition}$	$O_{Posttest}$
R	$O_{Screening}$	$X_{Word\ Modeling/High\ Repetition\ Condition}$	$O_{Posttest}$

Figure 3. Research Design.

Implementation Fidelity and Inter-Scorer Agreement

Implementation fidelity was collected on 21.2% of sessions across conditions of the intervention and across interventionists. A checklist for each intervention condition

was developed by the principal investigator based upon the procedure protocols (see Appendix B for the checklists). These checklists were used to observe an interventionist conduct the intervention session. Observers included the principal investigator and the interventionists who were trained on the study's procedures. Mean implementation fidelity was 100%. High implementation fidelity occurred because all interventionists were first trained by the principal investigator, then observed the principal investigator conduct the intervention session with one or more students following along with the intervention protocol sheet, and then followed with leading the intervention session and being observed by the principal investigator.

Inter-scorer agreement data were collected to ensure all interventionists were consistent in administration and scoring of the assessments. Inter-scorer agreement was determined by having an examiner observe the interventionist conduct the intervention conditions for a student and complete the scoring process on the story passage for both the first and the second readings of the passage. The number of agreed upon words by the interventionist and observer was then divided by the number of total agreements plus any disagreements. Inter-scorer agreement was conducted for 18.5% of the participants on the first read of the passage and 16.4% of the participants on the final read of the passage. This differed because three participants who were observed during the first read were discontinued from participation because they did not meet the eligibility criteria to continue with the study. Across all interventionists, the mean inter-scorer agreement was 98.9% with inter-scorer agreements ranging from 93.1% to 100%.

Data Analyses

To answer the first research question, a one-way analysis of variance (one-way ANOVA) was conducted to determine if there were any significant differences between the control condition and the four intervention conditions for the outcome measures of accuracy and WRCPM. Planned comparisons were then conducted to compare the control condition mean with each of the intervention condition means for both of the outcome measures. For the remainder of the research questions, the control condition was excluded from analyses.

A two-way analysis of variance (two-way ANOVA) was conducted to answer research questions 2, 4 and 6 using accuracy on the posttest (final read of the passage) as the dependent measure. An additional two-way ANOVA was conducted to answer research questions 3, 5 and 7 using WRCPM on the posttest assessment (final read of the passage) as the dependent measure. The two-way ANOVA was conducted to determine the main effects of modeling and sentence repetition as well as to determine if there was a significant interaction between these two independent variables on the outcome measures.

CHAPTER 4: RESULTS

The results of the current study are presented in this chapter. The research questions and hypotheses are first reviewed followed by providing descriptive statistics and presenting the data for each research question. The research questions (with hypotheses) guiding the study were:

1. What are the differences in accuracy and rate of words read correct per minute between the final readings of students in the PD conditions and those in the control condition?
2. What differences exist in students' accuracy of words read on the final read of the story passage based on the modeling component in the phrase drill intervention?
3. What differences exist in students' rate of words read correct per minute on the final read of the story passage based on the modeling component in the phrase drill intervention?
4. What differences exist in students' accuracy of words read on the final read of the story passage based on the repetition component in the phrase drill intervention?
5. What differences exist in students' rate of words read correct per minute on the final read of the story passage based on the repetition component in the phrase drill intervention?
6. To what extent does an interaction occur between modeling and repetition components of the phrase drill intervention in effecting the accuracy of words read on the final read of the story passage for students?

7. To what extent does an interaction occur between modeling and repetition components of the phrase drill intervention in effecting the words read correct per minute on the final read of the story passage for students?

Based on the proposed Instructional Hierarchy conceptual model and relevant empirical findings discussed above, the following results were expected for the research questions:

1. I hypothesized that each of the four experimental conditions will be significantly different than the control condition such that all conditions, on average, will have increased the accuracy of words read for the participants in comparison to the control condition participants. I hypothesized that all of the experimental conditions would not be significantly different than the control condition such that all conditions, on average, would have similar words read correct per minute for the participants in comparison to the control condition participants.
2. I hypothesized that a high level of modeling (i.e., Modeling condition) within the PD intervention, regardless of low or high sentence repetition, would lead to a significant increase in accuracy on the final read for participants compared to the low level of modeling (i.e., Sound Prompt condition) within the PD intervention.
3. I hypothesized that a high level of modeling within the PD intervention, regardless of low or high repetition, would not result in a significant difference in words read correct per minute (i.e., proficiency) on the final read for students compared to the low level of modeling.
4. I hypothesized that a high level of sentence repetition within the PD intervention, regardless of low or high modeling, would not result in a significant difference in

accuracy on the final read for students compared to the low level of sentence repetition.

5. I hypothesized that a high level of sentence repetition within the PD intervention, regardless of low or high modeling, would not result in a significant difference in the rate of words read correct on the final read compared to the low level of repetition.
6. I hypothesized that there would be not be a significant interaction effect between modeling and sentence repetition for accuracy of words read on the final read of the story passage.
7. I hypothesized that there would not be a significant interaction effect between modeling and sentence repetition for rate of words read correct on the final read of the story passage.

Descriptive Statistics

Descriptive statistics are included in Table 5. After applying the eligibility criteria for the study no additional outliers were identified and the overall sample included 111 participants. Participants across conditions on the first read of the passage read with 85.6% accuracy on average (ranging from 66% to 93%) and read on average with 91.5% accuracy (69% to 100%) on the final read of the passage. Participants across conditions read on average 40.3 words correct per minute (ranging from 16 to 80 words) on the first read of the passage and 50 words (19 words to 105 words) on the final read of the passage. In general, accuracy on the final read was negatively skewed across all conditions and kurtosis values varied but remained within normal limits. For words read

correct per minute on the final read, there was a slight positive skew across all conditions and Kurtosis values varied but were close to zero. Therefore, the data were acceptably distributed to conduct parametric analyses.

Research Question 1: Differences between experimental conditions and control condition

A one-way between subjects analysis of variance (ANOVA) was used to answer the first research question in respect to the two outcome measures of accuracy and WRCPM on the final read of the passage. Prior to conducting the one-way ANOVA for both of these outcome measures looking at intervention effects, the Levene's test for homogeneity of variances was conducted. For both accuracy (p = .673) and WRCPM (p = .929), the Levene's test indicated there were homogeneity of variances.

First, a one-way ANOVA ($p < .05$) showed condition had a significant effect on accuracy, F (4, 106) = 5.21, $p < .05$, $\eta_p^2 = .164$. In considering the research question and hypothesis, Dunnett's test was then used to compare each intervention condition with the control condition. The test revealed that the Sound Prompt/High Repetition Condition (M = 91.28, SD = 7.08; p = .043, d = .64), the Word Modeling/Low Repetition (M = 93.86, SD = 6.05; p = .001, d = 1.14), and the Word Modeling/High Repetition (M = 94.54, SD = 4.25; p = .001, d = 1.46) had on average statistically higher accuracy levels than the Control Condition. The Sound Prompt/Low Repetition Condition was not significantly different than the Control Condition (M = 90.51, SD = 6.62; p = .101, d = .54).

Second, a one-way ANOVA ($p < .05$) showed condition did not have a significant effect on WRCPM, F (4, 106) = 1.49, p = .210, $\eta_p^2 = .053$. In considering the research

question and hypothesis, Dunnett's test was then used to compare each intervention condition with the control condition. The test revealed that each of the four intervention conditions had a similar WRCPM on average in comparison to the control condition but there were moderate to large effect sizes of the Modeling/High Repetition in comparison to the Control Condition (Cohen's $d = 0.72$) and the Sound Prompt/High Repetition Condition in comparison to the Control Condition (Cohen's $d = 0.50$).

Research Question 2: Differences in accuracy of words read for modeling component

A two-way between subjects ANOVA with modeling and sentence repetition as independent variables and accuracy as the dependent variable was conducted. The focus of this research question was the modeling component (see Table 6 for a summary of the results). The analysis revealed a significant main effect of modeling on accuracy of words read, $F(1, 85) = 6.54$, $p = .012$, $\eta_p^2 = .071$. When controlling for sentence repetition, the two high modeling conditions ($M = 94.21$, $SD = 5.13$) in which participants were modeled the words read incorrectly throughout the passage resulted in higher accuracy on the final read of the passage in comparison to the two low modeling conditions ($M =$

Table 5

Descriptive Statistics of Screening Measures and Posttest Outcome Measures

	Screening (first read)					Posttest (final read)				
Intervention Condition	*n*	*Mean*	*SD*	*Skew*	*Kurtosis*	*n*	*Mean*	*SD*	*Skew*	*Kurtosis*
All Conditions										
Accuracy	111	85.58%	6.95%	-0.89	-0.06	111	91.47%	6.50%	-1.13	-0.64
WRCPM	111	40.25	15.84	0.79	0.09	111	50.05	18.55	0.74	0.18
Control										
Accuracy	22	87.45%	5.53%	-1.35	2.16	22	87.17%	5.94%	-0.68	-0.29
WRCPM	22	38.25	15.18	0.72	0.82	22	44.58	16.86	1.03	0.78
Sound Prompt/Low Repetition										
Accuracy	23	86.69%	6.20%	-0.96	0.18	23	90.51%	6.62%	-1.24	0.59
WRCPM	23	42.22	16.37	0.59	-0.26	23	49.39	18.17	0.88	0.62
Sound Prompt/High Repetition										
Accuracy	22	85.39%	7.93%	-0.82	-0.42	22	91.28%	7.82%	-1.67	3.56
WRCPM	22	41.30	17.07	0.76	0.12	22	51.60	20.03	0.59	0.15
Word Modeling/Low Repetition										
Accuracy	21	84.30%	7.37%	-0.61	-0.60	21	93.86%	6.05%	-1.65	0.50
WRCPM	21	37.98	15.23	0.92	0.53	21	47.21	17.02	0.37	-0.52
Word Modeling/High Repetition										
Accuracy	23	84.03%	7.44%	-0.82	-0.04	23	94.54%	4.24%	-0.52	0.48
WRCPM	23	41.28	16.20	1.15	0.60	23	57.04	19.50	0.84	0.48

90.9, *SD* = 6.16) in which participants were provided the first sound for each incorrectly read word. A small to medium effect size was found for the modeling variable (Cohen, 1992), meaning that the effect for modeling accounted for 7.1% of the modeling variable plus associated error variance.

Table 6

Summary of ANOVA for Accuracy (N = 89)

Source	*SS*	*df*	*MS*	*F*	*p*	η_p^2
Modeling	.024	1	.024	6.540	.012	.071
Sentence Repetition	.001	1	.001	0.315	.576	.004
Modeling X Sentence Repetition	4.800E-6	1	4.800E-6	0.001	.971	.000
Within Groups (error)	.315	85	.004			

Research Question 3: Differences in rate of WRCPM for the modeling component

A two-way between subjects ANOVA with modeling and sentence repetition as independent variables and WRCPM as the dependent variable was conducted. The focus of this research question was the modeling component (see Table 7 for a summary of results). The analysis showed no significant main effect of modeling on WRCPM, *F* (1, 85) = 0.17, p = .682, η_p^2 = .002, meaning that providing the first sound of incorrectly read words to participants (i.e., sound prompt/low modeling conditions; *M* = 50.47, *SD* = 18.92) resulted in no difference in the WRCPM on the final read of the passage in comparison to modeling the whole word of all incorrectly read words to participants (word modeling/high modeling conditions; *M* = 52.35, *SD* = 18.81).

Research Question 4: Differences in accuracy of words read for sentence repetition component

A two-way between subjects ANOVA with modeling and sentence repetition as independent variables and accuracy as the dependent variable was conducted. The focus of this research question was the sentence repetition component (see Table 6 for a summary of results). The analysis showed no significant main effect of sentence repetition on accuracy of words read, F (1, 85) = 0.32, p = .576, η_p^2 = .004, meaning that having a student repeat a sentence three times (M = 92.95, SD = 5.97) after error correction and modeling procedures resulted in no difference in the accuracy of words read on the final read of the passage in comparison to the student repeating the sentence one time (M = 92.11, SD = 6.50).

Table 7

Summary of ANOVA for WRCPM (N = 89)

Source	*SS*	*df*	*MS*	*F*	*p*	η_p^2
Modeling	59.31	1	59.31	0.169	.682	.002
Sentence Repetition	805.77	1	805.77	2.294	.134	.026
Modeling X Sentence Repetition	322.67	1	322.67	0.919	.341	.011
Within Groups (error)	29860.07	85	351.30			

Research Question 5: Differences in rate of WRCPM for sentence repetition component

A two-way between subjects ANOVA with modeling and sentence repetition as independent variables and WRCPM as the dependent variable was conducted. The focus of this research question was the sentence repetition component (see Table 7 for a summary of results). The analysis showed no significant main effect of sentence repetition on WRCPM, F (1, 85) = 2.29, p = .134, η_p^2 = .026. That is, having a student read a sentence one time (M = 48.35, SD = 17.46) after error correction/modeling procedures by each sentence resulted in no difference in the WRCPM on the final read of the passage in comparison to the student repeating the sentence three times (M = 54.38, SD = 19.73). However, a small effect size was found for sentence repetition such that the effect for sentence repetition accounted for 2.6% of the sentence repetition variable plus associated error variance.

Research Question 6: Interaction between modeling and sentence repetition component on accuracy of words read

A two-way between subjects ANOVA with modeling and sentence repetition as independent variables and accuracy as the dependent variable was conducted. The focus of this research question was the interaction effect between the two independent variables (see Table 6 for a summary of the results). The interaction effect between modeling and sentence repetition was not significant, F (1, 85) = 0.001, p = .971, η_p^2 = .001. Comparatively, no effects were found between the two conditions of modeling and the two conditions of sentence repetition on accuracy of words read.

Research Question 7: Interaction between modeling and sentence repetition component on WRCPM

A two-way between subjects ANOVA with modeling and sentence repetition as independent variables and WRCPM as the dependent variable was conducted. The focus of this research question was the interaction effect between the two independent variables (see Table 7 for a summary of results). The interaction effect between modeling and sentence repetition was not significant, F (1, 85) = .92, p = .341, η_p^2 = .011. Comparatively, no effects were found between the two conditions of modeling and the two conditions of sentence repetition on WRCPM.

Chapter 5: DISCUSSION

Organization of the Chapter

The current chapter provides a synthesis of the results of the present study. The chapter includes a review of the purpose of the study, a discussion of each research question and hypotheses contextualized within previous research, implications for practice and theory, directions for future research, and a review of the limitations of the study.

Review of Study Purpose

This study sought to use a conceptual model to identify potential causal mechanisms at play in the PD intervention. The research was carried out by looking at how the PD intervention works by isolating two specific instructional components that are typically used in the intervention that correlate with the IH instructional strategies for the acquisition and proficiency stages. Based on the IH conceptual model, acquisition level strategies that could function as causal mechanisms include corrective feedback, modeling or demonstration, and routine drill.

The current study focused on parsing out the effects of modeling and sentence repetition by creating intervention conditions through separating the two components into two levels (low and high conditions). A control condition was also incorporated in the design of the study. The study is one of the first to critically examine specific intervention components connected with a theory of learning using a between-subjects experimental design rather than using single-subjects design or small group designs to understand what

makes the intervention work and moves beyond only studying the effectiveness of the intervention.

Research Question 1: Differences between experimental conditions and control condition

The first research question required examining the differences between the four experimental conditions and control condition for accuracy of words read and WRCPM. For accuracy of words read, it was hypothesized that each of the four experimental conditions would be significantly different than the control condition such that all conditions (on average) would have increased the accuracy of words read for participants in comparison to the control condition participants. A one-way ANOVA revealed that condition had a significant effect on accuracy. Dunnett's test showed that participants in the Sound Prompt/High Repetition Condition, Word Modeling/Low Repetition Condition, and Word Modeling/High Repetition Condition each had on average statistically higher accuracy levels than the Control Condition participants. However, participants in the Sound Prompt/Low Repetition Condition had similar accuracy levels as the Control Condition participants.

The hypothesis for this research question was partially supported with three of the four experimental conditions leading to significantly higher accuracy of words read on the final read of the passage. Furthermore, the effect sizes for the Word Modeling/High Repetition Condition and Word Modeling/Low Repetition Condition were both large. The Sound Prompt/High Repetition Condition and Sound Prompt/Low Repetition Condition both had medium effect sizes. The study lends support to the effectiveness of

using PD to improve the accuracy of words read in connected text for second grade students who are identified as below benchmark. The results of the current study add to the empirical evidence for the effectiveness of using PD intervention to decrease errors made during reading and thereby increase overall word recognition accuracy in reading connected text (Begeny et al., 2006; Jones et al., 2009; Nelson et al., 2004; O'Shea et al, 1984).

The first research question also involved looking at the difference between the four experimental conditions and control condition for WRCPM. A one-way ANOVA revealed that condition did not have a significant effect on WRCPM. However, there were medium effect sizes for the Word Modeling/High Repetition Condition and Sound Prompt/High Repetition in comparison to the Control Condition. Overall, the hypothesis was partially supported because participants in the four experimental conditions had similar WRCPM in comparison to the Control Condition participants, but the results also suggest that the two conditions including high repetition resulted in increased words read correct per minute given the medium effect sizes found. Previous studies have found mixed results on PD's effects on improving WRCPM. While two studies found that the addition of the PD intervention did not significantly affect rate of words read correct per minute (Jones et al., 2009; Nelson et al., 2004), other studies did find a general increase in reading rate as well as decreased errors (Alber-Morgan et al., 2007; Daly et al., 1998; Fienup et al., 2015; Malanga, 2003).

One possibility for these mixed findings could be the levels of modeling and repetition included in the intervention packages. Similar to the current study, the

conditions resulting in increased words read correct included the high sentence repetition conditions and not the low sentence repetition conditions. Future research should continue to look at the effect of repetition on increasing WRCPM by refining the different types of repetition and practice used in PD. Another possible explanation may be the level of accuracy participants had when completing the study. If participants had a higher level of accuracy that matched their instructional level, such as 93% or higher accuracy, they may not only benefit from the PD intervention but also are more likely to benefit from a proficiency stage fluency intervention such as repeated reading which includes intense repetition (Parker & Burns, 2014). Overall, building the rate of words read correct is not the focus of the PD intervention and it makes sense that the PD intervention may not contribute to building the rate of proficient reading for students as much as it builds word recognition accuracy. Future research is needed to refine our understanding of the process.

Research Question 2: Differences in accuracy of words read for modeling component

The second research question examined the differences in students' accuracy of words read on the final read of the passage based on the modeling component. A two-way ANOVA revealed there was a significant main effect of modeling on accuracy of words read. In other words, when sentence repetition was controlled, the experimental conditions that included high word modeling resulted in participants reading with higher accuracy on the final read of the passage in comparison to participants in the

experimental conditions with low modeling (Sound Prompt condition). A medium effect size was found for the word modeling component.

These results supported the hypothesis, providing evidence that the high level of modeling (Word Modeling) included in the PD intervention lead to a practically significant difference in accuracy on the final read of the passage in comparison to the low level of modeling (Sound Prompt). Furthermore, both high modeling conditions, regardless of level of repetition, resulted in increasing word accuracy above 93% which is often considered to be a necessary criterion for a child to attain in order to be reading at their instructional level (Gickling & Thompson, 1985).

It was hypothesized that this difference would exist because the modeling component was thought to be a causal mechanism of the PD intervention based on the IH conceptual model. The hypothesis was supported, lending support for the modeling component as a causal mechanism of the PD intervention. The results also lend support for the use of the IH conceptual model for identifying causal mechanisms. That is, these results provide evidence that the modeling instructional strategy proposed by Haring and Eaton (1978) is an essential strategy—a causal mechanism—to improve skill development at the acquisition level of the hierarchy. The results of the current study are consistent with the effectiveness of modeling for increasing accurate responding of students participating in acquisition stage mathematic interventions with frustration level computational skills (Burns et al., 2010).

Research Question 3: Differences in rate of WRCPM for the modeling component

The third research question examined the differences in students' WRCPM on the final read of the passage based on the modeling component of the PD intervention. A two-way ANOVA revealed there was no main effect of modeling on WRCPM. Thus, participants who were in the Sound Prompt Condition and participants in the Word Modeling Condition had similar WRCPM on the final read of the passage. These results supported the hypothesis, which predicted that a high level of modeling within the PD intervention would not result in a significant difference in WRCPM on the final read for participants compared to the low level of modeling. These results are not surprising because, based on the IH conceptual model, the modeling component is thought to increase accuracy of word recognition but not necessarily increase reading rate (Daly et al., 1996; Haring & Eaton, 1978). Rather, increasing reading rate requires high levels of opportunities to respond through repetition and practice.

Overall, the results are consistent with past empirical studies that also found the use of PD resulted in fewer errors and therefore increased accuracy during reading passages (Begeny et al., 2006; Jones et al., 2009; Nelson et al., 2004). However, some studies also found PD improved reading rate in addition to accuracy (Alber-Morgan et al., 2007; Daly et al., 1998; Malanga, 2003), but these studies implemented intervention packages that included PD, repeated reading, and performance feedback components which makes it difficult to determine what component caused the improvement in reading rate.

Research Question 4: Differences in accuracy of words read for sentence repetition component

The fourth research question examined the differences in students' accuracy of words read on the final read of the passage based on the sentence repetition component. A two-way ANOVA revealed there was no main effect of sentence repetition on accuracy of words read. Thus, participants who were in the Low Repetition condition and participants in the High Repetition condition had similar accuracy of words read on the final read of the passage. These results supported the hypothesis, which predicted that a high level of sentence repetition within the PD intervention would not result in a significant difference in accuracy on the final read for participants compared to the low level of sentence repetition.

These results are to be expected given what the IH conceptual model predicts. Sentence repetition or any other form of high repetition is predicted to improve reading fluency rate and is a strategy that should be utilized when a student is at the proficiency level in the Instructional Hierarchy (Daly et al., 1996). On the other hand, sentence repetition would not be predicted to increase accuracy of words read because it is not an acquisition level instructional strategy. These results lend evidence for demonstrating that the sentence repetition component is not a causal mechanism for the PD intervention. That said, this component remains a vital piece of the intervention given that previous research studies have demonstrated the importance of reading incorrect words in context by re-reading the phrase or sentence (Glynn, 1985; O'Shea et al., 1984; Singh & Singh, 1986), but it likely does not function as a causal mechanism of the PD intervention.

Research Question 5: Differences in rate of WRCPM for sentence repetition component

The fifth research question examined the differences in students' WRCPM on the final read of the passage based on the sentence repetition component. A two-way ANOVA revealed there was no main effect of sentence repetition on WRCPM. These results support the hypothesis which predicted that participants in the high sentence repetition condition within the PD intervention would not result in a significant difference in WRCPM on the final read of the passage in comparison to participants in the low sentence repetition condition. However, a small effect size was found for sentence repetition meaning the sentence repetition variable did account for a small portion of the overall variance. Given that a high level of sentence repetition means that participants would re-read any sentences in the passage with error words, it is possible that for some participants this resulted in increasing the overall rate of words read correct. This is in line with evidence that suggests rereading and high levels of practice supports proficient reading (Therrien, 2004). Yet, it is likely that this effect was only small because not all sentences of the story were repeated. It is known within the literature that effective reading fluency interventions focused on building reading rate require higher levels of repeated practice on all words in a story. Additionally, the participants in the study were reading a story at their frustrational level (less than 93% accuracy) rather than instructional level which decreases the likelihood that high levels of repetition will be effective in increasing reading rate (Parker & Burns, 2014). This result is also in line with the IH conceptual model such that sentence repetition does not function as a causal

mechanism of the PD intervention and therefore will not result in significant increases in WRCPM.

Research Question 6 and 7: Interaction between modeling and sentence repetition component on accuracy of words read and WRCPM

The sixth research question examined if there was an interaction between the modeling and sentence repetition components on accuracy of words read correct on the final read of the story passage. A two-way ANOVA revealed no significant interaction between the modeling and sentence repetition components. Thus, no interaction effect was found between the two conditions of modeling and the two conditions of sentence repetition on accuracy of words read and the hypothesis for this research question was supported. These results also lend support for the IH conceptual model because the only main effect found was for the modeling component. The sentence repetition component did not play a significant role in increasing accuracy of word recognition such that low sentence repetition and high repetition both resulted in similar levels of accuracy for participants.

The seventh research question examined if there was an interaction between the modeling and sentence repetition components on WRCPM on the final read of the story passage. A two-way ANOVA revealed no significant interaction between the modeling and sentence repetition components. Thus, the hypothesis was supported, meaning no effects were found between the two conditions of modeling and the two conditions of sentence repetition on WRCPM. This result is also not surprising because the PD

intervention is not focused on increasing reading rate and no main effects were found for WRCPM and therefore no interaction effect was expected to be found either.

Implications

Implications for Theory

The primary purpose of this study was to begin building evidence for using the IH as a conceptual model to identify and study causal mechanisms for reading interventions. In applying Kazdin's (2007) recommendations for conducting research on mechanisms, a conceptual model best able to identify and explain mechanisms must consider important aspects tied to how research is conducted. First the model must consider aspects across effective academic interventions that point to mechanisms at work with specific reading interventions. Second, the model should have a strong theoretical foundation and support current empirical research. Third, the model should provide a way to synthesize and understand how the evidence points to mechanisms and ways to dig deeper to study mechanisms. Fourth, the model must recognize and account for other variables involved that may impact outcomes such as moderator effects in addition to any mechanisms at work. Finally, the model should also provide a concrete way to test for causal mechanisms that can be conducted in applied settings.

The IH conceptual model fits Kazdin's (2007) recommendations. First, the model supports the consideration of aspects that make academic interventions effective in general (Burns et al., 2014). Secondly, empirical evidence has consistently supported the utility of the IH in developing interventions for individual student needs depending on his or her learning stage (Ardoin & Daly, 2007; Burns et al., 2010; Chafouleas et al., 2004;

Daly & Martens, 1994; Daly et al., 1996; Parker & Burns, 2014; Martens & Eckert, 2007; Morgan & Sideridis, 2006; Szadokierski, 2012). Third, in the current study, the IH conceptual model provided a concrete way to test for potential causal mechanisms and was conducted in the school setting. The results of the study provide beginning support for the use of IH as a conceptual model to identify causal mechanism because the current study found that a high level of modeling was essential to the effectiveness of PD for the sample of students reading below benchmark, and modeling could function as a causal mechanism in the PD intervention. Moreover, high sentence repetition was no more effective than low sentence repetition, which suggested that repetition did not function as a causal mechanism in the PD intervention. These results were expected given PD is an acquisition level fluency intervention, and modeling and corrective feedback are important components of acquisition interventions. Whereas, high repetition is predicted to be needed for proficiency level reading fluency interventions rather than acquisition level interventions (see Table 2). Fourth, the model offers a way to interpret what the findings of the current study mean and how to conduct future studies to continue building empirical support for the model. Lastly, the model has the potential to account for potential moderator variables (see Figure 1 above) such as timing, duration and intensity of intervention, and intervention group size. However, the current study did not look specifically at moderator variables and additional research is needed.

Researchers who conducted studies on interventions in the field of school psychology must continue to increase their inclusion of theory in a meaningful way. One critical piece of the focus on theory-driven intervention research that needs additional

focus is the study of causal mechanisms. Studying causal mechanisms is an essential but often forgotten aspect of reading intervention research. Most often, researchers in the field focus only on the effectiveness of an intervention, but prominent researchers in the field have argued that researchers must move beyond description and effectiveness studies of interventions and begin to focus on understanding how the interventions work (Burns, 2011; Hughes, 2000; Hughes, 2015; Mercer et al., 2014). The current study is one of the first to uniquely focus on the study of an intervention's causal mechanisms through the initial testing of a conceptual model.

Implications for Practice

An essential reason for studying causal mechanisms in reading interventions is because it can lead to more effective and efficient interventions (Burns, 2011; Kazdin & Nock, 2013; Tharinger, 2000). Looking more closely at specific components used within the PD intervention can help provide insight into what makes it work by deciphering which instructional components function as causal mechanisms and connecting them with a sounder theoretical model and understanding of reading fluency development. By looking at components, researchers may begin to better understand what makes the intervention more effective for a wider range of students in a shorter amount of time in order to build reading fluency skills. Given the results of the current study, many components used within the PD intervention may contribute to its success but it is likely that modeling functions as a causal mechanism and plays a considerable role in improving reading fluency skills for students reading below benchmark. In knowing that modeling functions as the causal mechanism, educators and teachers who are

implementing the PD intervention should include a high level of modeling (such as word modeling) along with immediate corrective feedback in the intervention. On the other hand, they do not need to focus on having students re-read each sentence or phrase multiple times because re-reading the phrase or sentence with the error words once is sufficient. This in turn can reduce the time needed to carry out the intervention but the intervention itself will remain highly effective.

Another important practice implication is that the PD intervention can be used as an effective way to build accuracy of word recognition when reading connected text at grade level even if the passage may be at a student's frustrational level. Because the PD intervention provides immediate corrective feedback and high levels of modeling of incorrectly read words, students are provided with the support they need to persist and read passages that are considered to be at their frustration level. Although researchers often recommend students should not read materials that is within a frustration level for them (Gravois & Gickling, 2008), it is possible that PD may reduce potential frustration when reading grade-level materials which in turn may provide more opportunities for students reading below benchmark to access grade-level instructional content. However, additional research is needed to better understand the effects of PD using grade-level materials on overall reading fluency growth in comparison to the effects of other reading fluency interventions that use instructional level materials.

The IH conceptual model can also be used to specify the use of instructional components that should be included in PD for second-grade students. As intended by Haring and Eaton (1978), the conceptual model and study of causal mechanisms through

the use of the IH can be easily translated to the classroom setting for educators to use. Because the causal mechanisms are identified as instructional components, teachers can straightforwardly identify and use these components to help determine how to adjust their instructional decisions and intervention choices based on students' skill level development within the IH stages. For example, a student who is demonstrating low accuracy and reading rate when reading grade-level passages may be identified as needing an acquisition level intervention that includes intensive modeling. Whereas a student who is demonstrating high accuracy when reading passages but a slow reading rate may be identified as needing a proficiency level intervention that includes high levels of repetition or practice (Therrien, 2004).

The idea that intervention components are chosen based upon a student's functioning in a specific skill has been proposed by researchers in the field (Burns et al., 2010) and is called a Skill-by-Treatment Interaction (STI) approach. An important advantage of this approach is that the design of the intervention is focused on identifying alterable variables of the student's difficulties through direct measures of the skill. While empirical research studies have support the use of an STI approach to building reading and mathematics interventions, school psychologists and educators in the field often continue to use an aptitude-by-treatment interaction through cognitive assessments of student performance (Burns, 2016). However, the aptitude-by-treatment interaction has not resulted in effective reading and mathematics interventions for struggling students (Kavale & Forness, 2000). For example, Burns (2016) synthesized more than 200 studies from seven meta-analyses, finding a negligible to small effect for cognitive assessments

and interventions for improving reading and mathematics skills. Thus, the empirical evidence suggests school psychologists and educators trained in an aptitude-by-treatment interaction approach must reconsider its use for developing reading and math interventions. Instead, using direct measures of academic skills within an STI approach will likely be more effective.

Limitations

The findings of the current study should be considered within the context of possible limitations. First, this study only included second grade students identified as students reading below benchmark using a specific CBMReading assessment system. In the current study, participants across conditions read on average 40.3 words correct per minute (ranging from 16 to 80 words) on the first read of the passage which placed all participants below the 35th percentile of the winter benchmark normative sample (Christ et al., 2014). This would suggest that all students in the sample were at a low to high risk for reading difficulties. However, the current findings may not extend to other samples of second grade students reading at different reading fluency rates or using a different benchmark to determine reading fluency needs.

The findings may also not extend to students in other grades who are in need of the same intervention. Although results of previous research supported the effectiveness of the PD intervention within elementary and middle school populations (Jones & Wickstrom, 2002; Pany & McCoy, 1988; Singh et al., 1985), generalizing the findings from the sample to the general population of struggling readers will require continued

research. Researchers should continue to investigate what makes PD work across student groups from diverse populations, ages, and geographic areas.

A second limitation of the study was in the way the PD intervention was carried out. In the current study the intervention was implemented with closely controlled procedures for each of the instructional components and it is therefore unclear if the findings of the current study would hold for other different parameters. First, in order to collect screening data, the corrective feedback and modeling were provided after the participant read the entire story rather than providing more immediate feedback right when error words occurred during reading. There is some evidence that suggests immediate whole-word correction is more effective than delayed correction (i.e., tutor provides model of word at end of reading session; Barbetta et al., 1994). However, even with the delayed error correction and modeling, the findings of the study for the high modeling conditions resulted in medium effect sizes which indicate the general effectiveness of error correction regardless of when this feedback happens during the intervention session. The study was also carried out using sentence repetition rather than phrase repetition in order to keep the intervention procedures more simple. In previous research studies, the PD intervention has been carried out using this same procedure but other studies have had students read smaller, meaningful phrases with the corrected words. Interventions including either of these variations have demonstrated positive effects (Nelson et al., 2004; O'Shea et al., 1984). Because sentence repetition was not found to be a causal mechanism of the PD intervention, it may be more efficient to have students read shorter but meaningful phrases than the full sentence to optimize

intervention time. Additionally, the study was carried out with participants reading with accuracy levels as low as 65% on the reading passage. It is possible these participants may not have a high enough accuracy level to benefit from the PD intervention. The current study arbitrarily set 65% as the standard. Future research should examine possible criterion levels to improve the effectiveness and efficiency of the PD intervention.

A third limitation to the current study was the number of participants in each intervention condition which was lower than the desired group size when planning the study. An a priori power analysis recommended a total sample of 140 but the current study only included a total of 111 participants. While more definitive results may have been attained with a greater *n*, particularly in better understanding the impact of WRCPM on repetition, the strengths of the relationships obtained in the current study despite the lower number of participants indicated there were real differences found between the intervention conditions.

A fourth limitation of the study was that demographic information included students identified with the initial criteria which included 146 students. Because of the district policies in place to protect student identities, the researcher only received de-identified information on all participants and this could not further be disaggregated to the 111 participants who were included in the results of the study.

A fifth limitation of the study was that participants came from two different districts and were likely exposed to different reading curricula as well as different types of reading intervention supports over the course of the school year. The current study was

not able to control these variations in exposure to the core curriculum or intervention supports and this is a potential threat to the current study's internal validity.

Finally, the current study only lends evidence to the use of the IH conceptual model at the acquisition stage of skill development. The study did not focus on the other three stages of the IH. Further evidence is needed to confirm that the IH conceptual model can also be used to identify causal mechanisms at the proficiency stage, generalization stage, and adaption stage.

Directions for Future Research

The current study was one of the first of its kind to provide evidence for using the IH as a conceptual model for identifying causal mechanisms of reading interventions by investigating causal mechanisms of the PD intervention using a between-subjects factorial design. The current study not only lends evidence of the use of the IH as a conceptual model to identify causal mechanisms but also provides support for using factorial research designs that can parse out the effects of specific instructional components that may function as causal mechanisms in reading interventions. Although different methods are available for testing the plausibility of proposed mechanisms at work in reading interventions, the approach taken in the current study adapted Kazdin and Nock's (2003) criteria when testing mechanisms of PD (see Table 3). The approach was very useful, but additional research is warranted for evaluating the criterion because this was not the focus of the current study.

Furthermore, additional research is needed to continue building evidence for the IH conceptual model as well as considering other possible causal mechanisms of the PD

intervention along with other reading fluency interventions. While the current study looked at two instructional components, future research studies can continue to parse out instructional components such as different types of corrective feedback or routine drill using similar methodology and factorial designs. There are many different ways to provide corrective feedback to students when reading connected text and additional research is needed to identify what types and how much corrective feedback is necessary for reading fluency interventions targeted at the acquisition stage of the IH. The current study was constrained to looking at low and high levels of modeling which is one type of corrective feedback provided to students but the study also only included a high level of error correction feedback because all intervention conditions included correcting all error words. This type of feedback was also provided after the entire story was read. Other types of corrective feedback may involve only providing corrective feedback and modeling for meaningful words in the text and providing immediate corrective feedback right after a student incorrectly reads a word (Hoffman, 1979; Jenkins & Larsen, 1979; Nelson et al., 2004; Pany et al., 1981).

A second direction for future research might investigate causal mechanisms of other reading fluency interventions that target the acquisition stage such as supported closed procedure or listening passage preview. Because these reading fluency interventions also target building accuracy of reading fluency skills (Daly & Martens, 1994; Rasinski, 2003), it could be predicted that intensive modeling (e.g., reading the entire passage to the student and corrective feedback for error words using word modeling) will also function as a causal mechanism for these interventions like the PD

intervention. In turn, results for other accuracy interventions that were similar to the current findings would lend additional evidence for using the IH conceptual model.

In addition to investigating reading fluency interventions targeted at the acquisition stage of the IH, researchers should study potential causal mechanisms of reading fluency interventions targeting the proficiency stage such as the repeated reading intervention. The predicted causal mechanisms at the proficiency stage include frequent opportunities to respond, performance feedback, and reinforcement. Future research studies can also extend the use of the IH conceptual model to reading interventions targeting all stages of the hierarchy in the other four subskill areas of reading including phonemic awareness, phonics, comprehension, and vocabulary (NICHHD, 2000).

A third direction for future research might be conducting longitudinal experimental studies to confirm if the causal mechanism identified in the current study remains effective as the intervention is carried out with students in multiple sessions over months. Beginning evidence would suggest that this is the case (Szadokierski, 2012), but additional evidence is warranted. Additionally, future studies should address transfer, maintenance, and generalization effects to determine if students receiving the PD intervention on one story passage may then transfer their learning of words to similar but novel story passages.

A fourth direction for research would be to identify a quick criterion to use in order to identify students in need of a reading fluency at the acquisition stage and then the proficiency stage. The current study was able to identify students who would likely benefit from the intervention by first looking at student's performing below the 50th

percentile on a CBM-R in comparison to grade-level peers in their district. After identifying these struggling readers, participants were further identified by looking at the percent of words read correct. Students reading between 65% and 93% were identified as likely to benefit from the current PD intervention because they were most in need of an intervention that targeted increasing their ability to read words accurately in connected text. Although continued research is needed to determine a specific criterion for making decisions for reading fluency interventions, this study lends beginning support for implementing the PD intervention for students with accuracy rates between 65% and 93%. Another possible criterion was suggested by Szadokierski (2012) who suggested a possible decision model could be that student's performing below the 50th percentile on a CBM-reading passage in comparison to school or district norms and had an accuracy score below 85% and/or reads less than 32 words correctly would be identified in need of an acquisition level reading fluency intervention. Whereas, students reading above 85% accuracy and over 32 words correct per minute would be identified as needing a proficiency level reading fluency intervention. However, additional studies are needed to clarify the decision points as there remains a mixed consensus for what level of accuracy and rate of reading should be used.

Future research could also consider the mediation effects of accuracy and rate. This study did not look at this but it is possible that the accuracy level of a student on the first read of the story passage may mediate the growth rate of building accuracy and rate on the final read of the passage. Future studies could look more closely at the level of accuracy and WRCPM on how quickly students build reading fluency skills. This may in

turn help educators better determine what intervention will be most effective for each student.

Conclusion

There are three key findings of the current study. First, the results provide evidence for the effectiveness of the PD intervention in increasing the ability of second grade readers identified as having potential reading difficulties to accurately read words in connected text. Second, modeling functions as a potential causal mechanism of the PD intervention but sentence repetition does not function as a causal mechanism. Third, the results lend preliminary support for using the IH conceptual model to identify causal mechanisms of reading interventions. Modeling was identified to be a causal mechanism of the PD intervention which was what was predicted to be the case given that PD is an acquisition level intervention.

Studying potential mechanisms underlying reading interventions is an important area of research to undertake. We must move toward identifying how and why reading interventions are effective for students above and beyond understanding effectiveness of interventions. Studying mechanisms is not easy, but the creation of a conceptual model to hypothesize and test possible causal mechanisms makes it more feasible. The IH conceptual model outlined and tested in this current study is connected to theory and past empirical research on reading and provides a common language to utilize in conducting research on mechanisms. Systematically studying causal mechanisms for reading interventions through a working conceptual model can synchronize research efforts on reading interventions and bring much needed coherency to the field. It supports the

development and refinement of reading interventions, making the interventions more efficient and effective. It also assists in better understanding possible moderators involved, can lend support for existing theories, and build upon our empirical knowledge base within reading intervention work. Ultimately, it may contribute to providing optimal intervention supports to struggling readers in early childhood into adolescence to ensure they gain the reading skills and competence necessary to succeed in the classroom and in their forthcoming learning endeavors throughout their lives.

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Appendices

Appendix A.

Intervention protocols for each condition.

Control Condition (Read passage 2x – no corrective feedback)

1. Articulate objective and explain reading activity.

   Explain that the participant will be reading a story passage all the way through two times, "**Today you will be reading a story passage called '*Tommy and Pete'* all the way to the end. I will be following along with you as you read and time you. Then, we will go back and read the story one more time all the way to the end."**

2. Check for understanding.

   Say, "**Do you have any questions?"**

3. Student reads the story. (Mark start time, and mark total time reading passage)

   When I say 'begin' start reading aloud at the top of the page. Try to read each word. If you come to a word you don't know, try to sound it out or skip it." Say **"begin,"** start the timer when the student reads the first word, and follow along with the student underling/highlighting any incorrect words. At the end of 1 minute, place a bracket after the last word and let the student keep reading. Record the total time after the student reads the last word.

   - If student does not read a word in 3 seconds (or is seeking your help or misread the word) point to the next word and say **"try the next word";** do not read any word to the student. For all other errors, do not correct the student – instead, mark the error as incorrect and let the student continue reading.

4. Student reads the story again. (mark total time reading passage, and mark end time)

   Say, "**Okay, Now, I want you to read the story one more time...Begin."**

   - There are no error correction in the control condition. Try not to prompt the child to read more quickly or try to read faster. At the end of 1 minute, place a bracket after the last word and let the student keep reading. Record the total time after the student reads the last word.

Sound Prompt/Sentence Repetition 1x

1. Articulate objective and explain reading activity.

   Explain that the participant will be reading a story passage all the way through two times, "**Today you will be reading a story passage called '*Tommy and Pete'* all the way to the end. I will be following along with you as you read and time you. After you read the story we will go over any words that were incorrect and reread the sentences too. Then, we will go back and read the story one more time all the way to the end."**

4. Check for understanding. Ask, "**Do you have any questions?"** Place student copy of passage in front of student.

5. Student reads the story passage**.** (Mark start time and mark total time reading passage)

   Say, "**When I say 'begin' start reading aloud at the top of the page. Try to read each word. If you come to a word you don't know, try to sound it out or skip it.** Say **"begin,"** start the timer when the student reads the first word, and follow along with the student underling or highlighting any incorrect words. At the end of 1 minute, place a bracket after the last word and let the student keep reading. Record the total time after the student reads the last word and WRC in one minute.

   - If student does not read a word in 3 seconds (or struggling to sound it out or seeking help) point to the next word and say, **"Try the next word."** Do not provide any words to the student or correct errors. With the exception of error correction, please follow standard CBM-reading procedures.

1. Provide feedback with error correction procedure (Condition B – Sound Prompt/Repeat Sentence 1x)

   For this condition, you will provide the first sound of incorrectly read words per each sentence in the story, have the student read the word(s) by each sentence and then have the student read the sentence containing the error word(s) one time. Then move on to the next sentence with errors. If a sentence contains more than one error word, work through each of the incorrectly read words and then have the student read the sentence. Only have students read through sentences if there were error words.

   a. After completing the story, tell the student, **"Now we will go back and review any words you said incorrectly or skipped. I'm going to say the first sound of each word you didn't get right and then you will try to sound out the words and read each sentence one time. Let's go to the first word from the beginning of the story"** (point to first incorrect word).
      - If the student needs help understanding the procedure, use **Cat** as an example, and say, "**For example, this word (**point to cat on the page) **begins with the /c/ sound, now what's this word? I**f correct say, "**Good, now let's try another word."**

   b. For words read incorrect, provide the first sound by saying, "**This word begins with the /_/ sound. What's this word?"**

      Student responds correctly: say, **"That's right, now read this sentence."** Point to the beginning of sentence containing the word(s) and let the student read the sentence. Then say, **"Let's go to the next sentence with incorrect words."**

      Student responds incorrectly: **No, this word begins with the /_/ sound; what's this word?" (**then follow same procedures for correct responses)
      - Provide confirmation if the student read the word correctly but don't provide the word if they cannot read it.

- Provide the *first sound 3 TIMES only*. If the student is not able to sound out and read the word correctly from the first sound after 3 times, move on to any other incorrect words in the sentence and/or say "**Try reading this sentence OR do your best to sound out all the words as you read"**

c. Continue with this error correction procedure throughout the story until all error words are corrected (and sentences are read) within the story.
   - If the student reads any words incorrectly while completing the sentence repetition, you may provide the first sound but DO NOT provide the correct word. They DO NOT need to read the sentence completely correct—Just read it through one time.
   - Students only need to read sentences with incorrect words. Any sentences without error words do not need to be read.

7. Student reads the story again. (mark end time)

Say, **"Okay, now we are done correcting mistakes. Nice work. Now, I want you to read the story one more time...Begin."**

- At the end of 1 minute, place a bracket after the last word and let the student keep reading. Record the total time after the student reads the last word.

Sound Prompt/Sentence Repetition 3x

1. Articulate objective and explain reading activity.

   Explain that the participant will be reading a story passage all the way through two times, "**Today you will be reading a story passage called '*Tommy and Pete'* all the way to the end. I will be following along with you as you read and time you. After you read the story we will go over any words that were incorrect and reread the sentences too. Then, we will go back and read the story one more time all the way to the end."**

2. Check for understanding. Ask, "**Do you have any questions?"** Place student copy of passage in front of student.

3. Student reads the story passage**.** (Mark start time, mark total time reading passage)

   Say, "**When I say 'begin' start reading aloud at the top of the page. Try to read each word. If you come to a word you don't know, try to sound it out or skip it.** Say **"begin,"** start the timer when the student reads the first word, and follow along with the student underling or highlighting any incorrect words. At the end of 1 minute, place a bracket after the last word and let the student keep reading. Record the total time after the student reads the last word and WRC in one minute.

   - If student does not read a word in 3 seconds (or struggling to sound it out or seeking help) point to the next word and say, **"Try the next word."** Do not provide any words to the student or correct errors. With the exception of error correction, please follow standard CBM-reading procedures.

4. Provide feedback with error correction procedure (Condition C – Sound Prompt/Repeat Sentence 3x)

   For this condition, provide the first sound of incorrectly read words by sentence, have the student sound out/read word(s) by each sentence and then have the student read the sentence containing the error word(s) three times. Then move on to the next sentence with errors. Go over all error words in a sentence and then have the student read the sentence three times. Only have students read through sentences if there were error words.

   a. After completing the story, tell the student, **"Now we will go back and review any words you said incorrectly or skipped in the story. I'm going to say the first sound of each word you didn't get right and then you will try to sound out the words and read each sentence three times. Let's go to the first word from the beginning of the story."** (point to first incorrect word at top of story).

      - If the student needs help understanding the procedure, use **Cat** as an example, and say, "**For example, this word (**point to cat on the page) **begins with the /c/ sound, now what's this word? I**f correct say, "**Good, now let's try another word."**

   b. For words read incorrect, provide the first sound by saying, "**This word begins with the /_/ sound. What's this word?"**

      Student responds correctly: say, **"That's right, now read this sentence."** Point to the beginning of sentence containing the word(s) and let the student read the sentence. Then say, **"Okay, now read it two more times…**(student reads)…**now one more time. Nice job! Let's go to the next sentence with incorrect words."**

      Student responds incorrectly: **No, this word begins with the /_/ sound; what's this word?" (**then follow same procedures for correct responses)

      - Provide confirmation if the student read the word correctly but don't provide the word if they cannot read it.

- Provide the first sound 3 TIMES only. If the student is not able to sound out and read the word correctly from the first sound after 3 times, move on to any other incorrect words in the sentence and/or say "**Try reading this sentence OR do your best to sound out all the words as you read"**

c. Continue with this error correction procedure throughout the story until all error words are corrected (and sentences containing the error words are read three times each) within the story.
   - If the student reads any words incorrectly while completing the sentence repetition, you may provide the first sound but DO NOT provide the correct word. They DO NOT need to read the sentence completely correct—Just read it through one time
   - Students only need to read sentences with incorrect words. Any sentences without error words do not need to be read.

5. Student reads the story again. (mark total time reading passage, and mark end time)
   Say, **"Okay, now we are done correcting mistakes. Nice work. Now, I want you to read the story one more time...Begin."**
   - At the end of 1 minute, place a bracket after the last word and let the student keep reading. Record the total time after the student reads the last word.

Word Modeling/Sentence Repetition 1x

1. Articulate objective and explain reading activity.

   Explain that the participant will be reading a story passage all the way through two times, "**Today you will be reading a story passage called '*Tommy and Pete'* all the way to the end. I will be following along with you as you read and time you. After you read the story we will go over any words that were incorrect and reread the sentences too. Then, we will go back and read the story one more time all the way to the end."**

2. Check for understanding. Ask, "**Do you have any questions?"** Place student copy of passage in front of student.

3. Student reads the story passage**. (**Mark start time, mark total time reading passage)
   Say, "**When I say 'begin' start reading aloud at the top of the page. Try to read each word. If you come to a word you don't know, try to sound it out or skip it.** Say **"begin,"** start the timer when the student reads the first word, and follow along with the student underling or highlighting any incorrect words. At the end of 1 minute, place a bracket after the last word and let the student keep reading. Record the total time after the student reads the last word and WRC in one minute.
   - If student does not read a word in 3 seconds (or struggling to sound it out or seeking help) point to the next word and say, **"Try the next word."** Do not provide any words to the student or correct errors.
   - With the exception of error correction, going through the passage is similar to standard CBM-reading procedures.

4. Provide feedback with error correction procedure (Condition D – Word Modeling/Repeat Sentence 1x)

   For this condition, you will model any incorrectly read words per each sentence in the story, have the student read the word(s) by each sentence, and then have the student read the sentence containing the error word(s) one time. Then move on to the next sentence with errors. If a sentence contains more than one error word, work through each of the incorrectly read words and then have the student read the sentence. Only have students read through sentences if there were error words.

   a. After completing the story, tell the student, **"Now we will go back and review any words you said incorrectly or skipped in the story. For each incorrect word, I'm going to say the word, then you will say the word and read the sentence the word is in. Let's go to the first word from the beginning of the story"** (point to first incorrect word).
      - If the student needs help understanding the procedure, use **Cat** as an example, and say, "**For example, this word is cat (**point to cat on the page), **what's this word?" I**f correct say, "**Good, now let's try another word."**

   b. For words read incorrect model the word, "**This word is _____, what's this word?"**
      Student responds correctly: **"That's right,** (read any additional error words in sentence first, then…) **now read this sentence."** Point to the beginning of sentence containing the word(s) and let the student read the sentence one time. Then say, **"Let's go to the next sentence with incorrect words."**
      Student responds incorrectly: "**No, this word is ___; what's this word?" (**then follow same procedures for correct responses)
      - Model the word 3 times only. If the student is not able to read the word correctly after three times move on to any other incorrect words in the sentence and/or say "**Try reading this sentence and do your best to sound out all the words as you read"**

c. Continue with this error correction procedure throughout the story until all error words are corrected (and sentences are read) within the story.
    - When the student is reading the sentence, you may correct error words as the student reads but do not have them go back and read the sentence again. They DO NOT need to read the sentence completely correct—Just read it through one time.

5. Student reads the story again. (mark total time reading passage, and mark end time)
   Say, **"Okay, now we are done correcting mistakes. Nice work. Now, I want you to read the story one more time...Begin."**
    - Students only need to read sentences with incorrect words. Any sentences without error words do not need to be read.
    - At the end of 1 minute, place a bracket after the last word and let the student keep reading. Record the total time after the student reads the last word.

Word Modeling/Sentence Repetition 3x

1. Articulate objective and explain reading activity.

   Explain that the participant will be reading a story passage all the way through two times, "**Today you will be reading a story passage called '*Tommy and Pete'* all the way to the end. I will be following along with you as you read and time you. After you read the story we will go over any words that were incorrect and reread the sentences too. Then, we will go back and read the story one more time all the way to the end."**

2. Check for understanding. Ask, "**Do you have any questions?"** Place student copy of passage in front of student.

3. Student reads the story passage. (Mark start time, mark total time reading passage)
   Say, "**When I say 'begin' start reading aloud at the top of the page. Try to read each word. If you come to a word you don't know, try to sound it out or skip it.** Say **"begin,"** and start the timer when the student reads the first word, and follow along with the student underling or highlighting any incorrect words. At the end of 1 minute, place a bracket after the last word and let the student keep reading. Record the total time after the student reads the last word and WRC in one minute.
   - If student does not read a word in 3 seconds (or struggling to sound it out or seeking help) point to the next word and say, **"Try the next word."** Do not provide any words to the student or correct errors.
   - With the exception of error correction, going through the passage is similar to standard CBM-reading procedures.

4. Provide feedback with error correction procedure (Condition E – Word Modeling/Repeat Sentence 3x)

   For this condition, you will model any incorrectly read words per each sentence in the story, have the student read the word(s) by each sentence, and then have the student read the sentence containing the error word(s) three times. Then move on to the next sentence with errors. If a sentence contains more than one error word, work through each of the incorrectly read words and then have the student read the sentence three times. Only have students read through sentences if there were error words.

   a. After completing the story, tell the student, **"Now we will go back and review any words you said incorrectly or skipped in the story. For each incorrect word, I'm going to say the word, then you will say the word and read the sentence the word is in three times. Let's go to the first word from the beginning of the story"** (point to first incorrect word).
      - If the student needs help understanding the procedure, use **Cat** as an example, and say, "**For example, this word is cat (**point to cat on the page), **what's this word?" I**f correct say, "**Good, now let's try another word."**

   b. Model each incorrect word in the sentence, "**This word is _____, what's this word?"** Student responds correctly: **"That's right,** (read any additional error words in sentence first, then…) **now read this sentence."** Point to the beginning of sentence containing the word(s) and let the student read the sentence three times. Say, **"Okay, now read it two more times…**(student reads)…**now one more time. Nice job! Let's go to the next sentence with incorrect words."** Student responds incorrectly: "**No, this word is ___; what's this word?" (**then follow same procedures for correct responses)
      - Model the word 3 times only. If the student is not able to read the word correctly after three times move on to any other incorrect words in the sentence and/or say "**Try reading this sentence and do your best to sound out all the words as you read"**

c. Continue with this error correction procedure throughout the story until all error words are corrected (and sentences are read three times each) within the story.
    - When the student is reading the sentence, correct error words as the student reads but do not have them go back and read the sentence again. They DO NOT need to read the sentence completely correct each of the three times—Just three reads total.
    - Students only need to read sentences with incorrect words. Any sentences without error words do not need to be read.

5. Student reads the story again. (mark total time reading passage, and mark end time)
   Say, **"Okay, now we are done correcting mistakes. Nice work. Now, I want you to read the story one more time...Begin."**
    - At the end of 1 minute, place a bracket after the last word and let the student keep reading. Record the total time after the student reads the last word.

Appendix B.

Fidelity checklists for the control condition and intervention conditions.

Name: _____FIDELITY Check Score: _____# of Yes/7

Participant ID: _____ _____% of Yes

Researcher

Yes	No	Intervention Procedure - Control Condition (A)
		1. General Greeting and Read Child Assent Form ➢ Read assent form to student, mark response on top of Admin passage copy (if yes), and record gender. ➢ If student does not want to participate, take them back to class and don't mark anything in the folder
		2. Administer WJ-III Word-Identification Subtest ➢ Start with item 17 on pg 19 i. Basal is 6 lowest-numbered items are administered correct ii. Ceiling is 6 highest-numbered items administered are incorrect
		3. Articulate objective and explain reading activity. Explain that the participant will be reading a story passage all the way through two times, **"Today you will be reading a story passage called '*Tommy and Pete*' all the way to the end. I will be following along with you as you read and time you. Then, we will go back and read the story one more time all the way to the end."**
		4. Check for understanding. Say, **"Do you have any questions?"**
		5. Student reads the story. (Mark start time, mark total time reading passage) **When I say 'begin' start reading aloud at the top of the page. Try to read each word. If you come to a word you don't know, try to sound it out or skip it."** Say **"begin,"** start the timer when the student reads the first word, and follow along with the student underling/highlighting any incorrect words. Record the total time after the student reads the last word. ➢ If student does not read a word in 3 seconds (or is seeking your help or misread the word) point to the next word and say **"try the next word"**; do not read any word to the student. For all other errors, do not correct the student – instead, mark the error as incorrect and let the student continue reading.
		6. Student reads the story again. (mark total time reading passage, and mark end time) Say, **"Okay, Now, I want you to read the story one more time...Begin."** ➢ There are no error correction in the control condition. Try not to prompt the child to read more quickly or try to read faster. At the end of 1 minute, place a bracket after the last word and let the student keep reading. Record the total time after the student reads the last word.
		7. Thank the student. Give the student a pencil and thank them for reading to you.

Observer Name: _____FIDELITY Check Score: _____# of Yes/10

Participant ID: _____ _____% of Yes

Person being observed:_____

Yes	No	Intervention Procedure - Sound Prompt/Sentence 1x (B)
		1. General Greeting and Read Child Assent Form ➢ Read assent form to student, mark response on top of Admin passage copy (if yes), and record gender. ➢ If student does not want to participate, take them back to class and don't mark anything in the folder
		2. Administer WJ-III Word-Identification Subtest ➢ Start with item 17 on pg 19 i. Basal is 6 lowest-numbered items are administered correct ii. Ceiling is 6 highest-numbered items administered are incorrect
		3. Articulate objective and explain reading activity. Explain that the participant will be reading a story passage all the way through two times, "**Today you will be reading a story passage called '*Tommy and Pete*' all the way to the end. I will be following along with you as you read and time you. Then, we will go back and read the story one more time all the way to the end.**"
		4. Check for understanding. Ask, "**Do you have any questions?**" Place student copy of passage in front of student.
		5. Student reads the story passage. (Mark start time, mark total time reading passage) Say, "**When I say 'begin' start reading aloud at the top of the page. Try to read each word. If you come to a word you don't know, try to sound it out or skip it.** Say **"begin,"** start the timer when the student reads the first word, and follow along with the student underling or highlighting any incorrect words. Record the total time after the student reads the last word and WRC in one minute. ➢ If student does not read a word in 3 seconds (or struggling to sound it out or seeking help) point to the next word and say, **"Try the next word."** Do not provide any words to the student or correct errors. With the exception of error correction, please follow standard CBM-reading procedures.
		6. Provide feedback with error correction procedure (Condition B – Sound Prompt/Sentence 1x) For this condition, you will provide the first sound of incorrectly read words per each sentence in the story, have the student read the word(s) by each sentence and then have the student read the sentence containing the error word(s) one time. Then move on to the next sentence with errors. If a sentence contains more than one error word, work through each of the incorrectly read words and then have the student read the sentence. Only have students read through sentences if there were error words.
		a. After completing the story, tell the student, **"Now we will go back and review any words you said incorrectly or skipped. I'm going to say the first sound of each word you didn't get right and then you will try to sound out the words and read each sentence one time. Let's go to the first word from the beginning of the story"** (point to first incorrect word). ➢ If the student needs help understanding the procedure, use Cat as an example, and say, "**For example, this word** (point to cat on the page) **begins with the /c/ sound, now what's this word?** If correct say, "**Good, now let's try another word.**"

		b. For words read incorrect, provide the first sound by saying, "**This word begins with the /_/ sound. What's this word?**" Student responds correctly: say, **"That's right, now read this sentence."** Point to the beginning of sentence containing the word(s) and let the student read the sentence. Then say, **"Let's go to the next sentence with incorrect words."** Student responds incorrectly: **No, this word begins with the /_/ sound; what's this word?"** (then follow same procedures for correct responses) ➢ Provide confirmation if the student read the word correctly but don't provide the word if they cannot read it.
		c. Provide the first sound 3 TIMES only. If the student is not able to sound out and read the word correctly from the first sound after 3 times, move on to any other incorrect words in the sentence and/or say "**Try reading this sentence OR do your best to sound out all the words as you read**" Continue with this error correction procedure throughout the story until all error words are corrected (and sentences are read) within the story. ➢ If the student reads any words incorrectly while completing the sentence repetition, you may provide the first sound but DO NOT provide the correct word. They DO NOT need to read the sentence completely correct—Just read it through one time ➢ Students only need to read sentences with incorrect words. Any sentences without error words do not need to be read.
		Student reads the story again. (mark total time reading passage, and mark end time) Say, **"Okay, now we are done correcting mistakes. Nice work. Now, I want you to read the story one more time...Begin."** Record the total time after the student reads the last word.
		8. Thank the student. Give the student a pencil and thank them for reading to you.

Observer Name: _____FIDELITY Check Score: _____# of Yes/10

Participant ID: _____ _____% of Yes

Person being observed:_____

Yes	No	Intervention Procedure - Sound Prompt/Sentence 3x (C)
		1. General Greeting and Read Child Assent Form ➢ Read assent form to student, mark response on top of Admin passage copy (if yes), and record gender. ➢ If student does not want to participate, take them back to class and don't mark anything in the folder
		2. Administer WJ-III Word-Identification Subtest ➢ Start with item 17 on pg 19 i. Basal is 6 lowest-numbered items are administered correct ii. Ceiling is 6 highest-numbered items administered are incorrect
		3. Articulate objective and explain reading activity. Explain that the participant will be reading a story passage all the way through two times, "**Today you will be reading a story passage called '*Tommy and Pete*' all the way to the end. I will be following along with you as you read and time you. After you read the story we will go over any words that were incorrect and reread the sentences too. Then, we will go back and read the story one more time all the way to the end.**"
		4. Check for understanding. Ask, "**Do you have any questions?**" Place student copy of passage in front of student.
		5. Student reads the story passage. (Mark start time, mark total time reading passage) Say, "**When I say 'begin' start reading aloud at the top of the page. Try to read each word. If you come to a word you don't know, try to sound it out or skip it.** Say **"begin,"** start the timer when the student reads the first word, and follow along with the student underling or highlighting any incorrect words. Record the total time after the student reads the last word and WRC in one minute. ➢ If student does not read a word in 3 seconds (or struggling to sound it out or seeking help) point to the next word and say, **"Try the next word."** Do not provide any words to the student or correct errors. With the exception of error correction, please follow standard CBM-reading procedures.
		6. Provide feedback with error correction procedure (Condition C – Sound Prompt/Sentence 3x) For this condition, you will provide the first sound of incorrectly read words per each sentence in the story, have the student read the word(s) by each sentence and then have the student read the sentence containing the error word(s) three times. Then move on to the next sentence with errors. If a sentence contains more than one error word, work through each of the incorrectly read words and then have the student read the sentence three times. Only have students read through sentences if there were error words.
		a. After completing the story, tell the student, **"Now we will go back and review any words you said incorrectly or skipped in the story. I'm going to say the first sound of each word you didn't get right and then you will try to sound out the words and read each sentence three times. Let's go to the first word from the beginning of the story."** (point to first incorrect word at top of story). ➢ If the student needs help understanding the procedure, use Cat as an example, and say, "**For example, this word** (point to cat on the page) **begins with the /c/ sound, now what's this word?** If correct say, "**Good, now let's try another word.**"

		b. For words read incorrect, provide the first sound by saying, "**This word begins with the /_/ sound. What's this word?**" Student responds correctly: say, **"That's right, now read this sentence."** Point to the beginning of sentence containing the word(s) and let the student read the sentence. Then say, **"Okay, now read it two more times…**(student reads)…**now one more time. Nice job! Let's go to the next sentence with incorrect words."** Student responds incorrectly: **No, this word begins with the /_/ sound; what's this word?" (**then follow same procedures for correct responses) ➢ Provide confirmation if the student read the word correctly but don't provide the word if they cannot read it. ➢ Provide the first sound 3 TIMES only. If the student is not able to sound out and read the word correctly from the first sound after 3 times, move on to any other incorrect words in the sentence and/or say "**Try reading this sentence and do your best to sound out all the words as you read"**
		c. Continue with this error correction procedure throughout the story until all error words are corrected (and sentences containing the error words are read three times each) within the story. ➢ If the student reads any words incorrectly while completing the sentence repetition, you may provide the first sound but DO NOT provide the correct word. They DO NOT need to read the sentence completely correct—Just read it through one time ➢ Students only need to read sentences with incorrect words. Any sentences without error words do not need to be read.
		7. Student reads the story again. (mark total time reading passage, and mark end time) Say, **"Okay, now we are done correcting mistakes. Nice work. Now, I want you to read the story one more time...Begin."** ➢ Record the total time after the student reads the last word.
		8. Thank the student. Give the student a pencil and thank them for reading to you.

Observer Name: _____ FIDELITY Check Score: _____# of Yes/10

Participant ID: _____ _____% of Yes

Person being observed:_____

Yes	No	Intervention Procedure - Word Modeling/Sentence 1x (D)
		1. General Greeting and Read Child Assent Form ➢ Read assent form to student, mark response on top of Admin passage copy (if yes), and record gender. ➢ If student does not want to participate, take them back to class and don't mark anything in the folder
		2. Administer WJ-III Word-Identification Subtest ➢ Start with item 17 on pg 19 i. Basal is 6 lowest-numbered items are administered correct ii. Ceiling is 6 highest-numbered items administered are incorrect
		3. Articulate objective and explain reading activity. Explain that the participant will be reading a story passage all the way through two times, "**Today you will be reading a story passage called '*Tommy and Pete*' all the way to the end. I will be following along with you as you read and time you. After you read the story we will go over any words that were incorrect and reread the sentences too. Then, we will go back and read the story one more time all the way to the end.**"
		4. Check for understanding. Ask, "**Do you have any questions?**" Place student copy of passage in front of student.
		5. Student reads the story passage. **(Mark start time, , mark total time reading passage)** Say, "**When I say 'begin' start reading aloud at the top of the page. Try to read each word. If you come to a word you don't know, try to sound it out or skip it.** Say "**begin,**" start the timer when the student reads the first word, and follow along with the student underling or highlighting any incorrect words. Record the total time after the student reads the last word and WRC in one minute. ➢ If student does not read a word in 3 seconds (or struggling to sound it out or seeking help) point to the next word and say, "**Try the next word.**" Do not provide any words to the student or correct errors. ➢ With the exception of error correction, going through the passage is similar to standard CBM-reading procedures.
		6. Provide feedback with error correction procedure (Condition D – Word Modeling/Sentence 1x) For this condition, you will model any incorrectly read words per each sentence in the story, have the student read the word(s) by each sentence, and then have the student read the sentence containing the error word(s) one time. Then move on to the next sentence with errors. If a sentence contains more than one error word, work through each of the incorrectly read words and then have the student read the sentence. Only have students read through sentences if there were error words.
		a. After completing the story, tell the student, "**Now we will go back and review any words you said incorrectly or skipped in the story. For each incorrect word, I'm going to say the word, then you will say the word and read the sentence the word is in. Let's go to the first word from the beginning of the story**" (point to first incorrect word). ➢ If the student needs help understanding the procedure, use Cat as an example, and say, "**For example, this word is cat** (point to cat on the page), **what's this word?**" If correct say, "**Good, now let's try another word.**"

		b. For words read incorrect model the word, **"This word is _____, what's this word?"** Student responds correctly: **"That's right,** (read any additional error words in sentence first, then…) **now read this sentence."** Point to the beginning of sentence containing the word(s) and let the student read the sentence one time. Then say, **"Let's go to the next sentence with incorrect words."** Student responds incorrectly: **"No, this word is ___; what's this word?" (**then follow same procedures for correct responses) ➢ Model the word 3 times only. If the student is not able to read the word correctly after three times move on to any other incorrect words in the sentence and/or say **"Try reading this sentence and do your best to sound out all the words as you read"**
		c. Continue with this error correction procedure throughout the story until all error words are corrected (and sentences are read) within the story. ➢ When the student is reading the sentence, you may correct error words as the student reads but do not have them go back and read the sentence again. They DO NOT need to read the sentence completely correct—Just read it through one time.
		7. Student reads the story again. (mark total time reading passage, and mark end time) Say, **"Okay, now we are done correcting mistakes. Nice work. Now, I want you to read the story one more time...Begin."** ➢ Students only need to read sentences with incorrect words. Any sentences without error words do not need to be read. ➢ Record the total time after the student reads the last word.
		8. Thank the student. Give the student a pencil and thank them for reading to you.

Observer Name: _____ FIDELITY Check Score: _____# of Yes/10

Participant ID: _____ _____% of Yes

Person being observed: _____

Yes	No	Intervention Procedure - Word Modeling/Sentence 3x (E)
		1. General Greeting and Read Child Assent Form ➢ Read assent form to student, mark response on top of Admin passage copy (if yes), and record gender. ➢ If student does not want to participate, take them back to class and don't mark anything in the folder
		2. Administer WJ-III Word-Identification Subtest ➢ Start with item 17 on pg 19 i. Basal is 6 lowest-numbered items are administered correct ii. Ceiling is 6 highest-numbered items administered are incorrect
		3. Articulate objective and explain reading activity. Explain that the participant will be reading a story passage all the way through two times, "**Today you will be reading a story passage called '*Tommy and Pete*' all the way to the end. I will be following along with you as you read and time you. After you read the story we will go over any words that were incorrect and reread the sentences too. Then, we will go back and read the story one more time all the way to the end.**"
		4. Check for understanding. Ask, "**Do you have any questions?**" Place student copy of passage in front of student.
		5. Student reads the story passage. (Mark start time, mark total time reading passage) Say, "**When I say 'begin' start reading aloud at the top of the page. Try to read each word. If you come to a word you don't know, try to sound it out or skip it.** Say "**begin,**" and start the timer when the student reads the first word, and follow along with the student underling or highlighting any incorrect words. At the end of 1 minute, place a bracket after the last word and let the student keep reading. Record the total time after the student reads the last word and WRC in one minute. ➢ If student does not read a word in 3 seconds (or struggling to sound it out or seeking help) point to the next word and say, "**Try the next word.**" Do not provide any words to the student or correct errors. ➢ With the exception of error correction, going through the passage is similar to standard CBM-reading procedures.
		6. Provide feedback with error correction procedure (Condition E – Word Modeling/Sentence 3x) For this condition, you will model any incorrectly read words per each sentence in the story, have the student read the word(s) by each sentence, and then have the student read the sentence containing the error word(s) three times. Then move on to the next sentence with errors. If a sentence contains more than one error word, work through each of the incorrectly read words and then have the student read the sentence three times. Only have students read through sentences if there were error words.
		a. After completing the story, tell the student, "**Now we will go back and review any words you said incorrectly or skipped in the story. For each incorrect word, I'm going to say the word, then you will say the word and read the sentence the word is in three times. Let's go to the first word from the beginning of the story**" (point to first incorrect word). ➢ If the student needs help understanding the procedure, use **Cat** as an example, and say, "**For example, this word is cat** (point to cat on the page), **what's this word?**" If correct say, "**Good, now let's try another word.**"

		b. Model each incorrect word in the sentence, "**This word is _____, what's this word?**" Student responds correctly: **"That's right,** (read any additional error words in sentence first, then…) **now read this sentence."** Point to the beginning of sentence containing the word(s) and let the student read the sentence three times. Say, **"Okay, now read it two more times…**(student reads)…**now one more time. Nice job! Let's go to the next sentence with incorrect words."** Student responds incorrectly: **"No, this word is ___; what's this word?"** (then follow same procedures for correct responses) ➢ Model the word 3 times only. If the student is not able to read the word correctly after three times move on to any other incorrect words in the sentence and/or say **"Try reading this sentence and do your best to sound out all the words as you read"**
		c. Continue with this error correction procedure throughout the story until all error words are corrected (and sentences are read three times each) within the story. ➢ When the student is reading the sentence, correct error words as the student reads but do not have them go back and read the sentence again. They DO NOT need to read the sentence completely correct each of the three times—Just three reads total. ➢ Students only need to read sentences with incorrect words. Any sentences without error words do not need to be read.
		7. Student reads the story again. (mark total time reading passage, and mark end time) Say, **"Okay, now we are done correcting mistakes. Nice work. Now, I want you to read the story one more time...Begin."** ➢ Record the total time after the student reads the last word.
		8. Thank the student. Give the student a pencil and thank them for reading to you.

Appendix C.

General directions.

General Overview Directions

2. General Greetings
3. Read **Child Assent Form** to child and mark their response on top of Admin story passage (if yes) and record gender.

   We are asking you if you would be willing to do a reading activity for a study. We are trying to better understand how children read. We are asking if you want to be in this study because your teacher recommended you.

   If you agree to be in this study, you will read do a few reading activities with me. You will get to read some words and then you will read a story. You can choose not to do the activity. If you do want to do it, you can stop being part of it at any time. Doing this reading activity is totally up to you, and no one will be mad if you don't want to do it. You can ask any questions that you have about the activity. If you think of questions later, you can ask them at any time.

   What do you think? Do you want to help out and do some reading?

4. Administer WJ-III Word-Identification Subtest
   a. Start with item 17 on pg 19, **"What is this word" (**point to *to*), **Go Ahead with the others. Don't go too fast"**
      i. Basal is 6 lowest-numbered items are administered correct
      ii. Ceiling is 6 highest-numbered items administered are incorrect
5. Complete Intervention using one of 5 conditions (identified in folder and admin copy)
   a. **Describe the Intervention activity** they will do based on what condition they were assigned and give the participant the student copy of the story passage (make sure to confirm the you are reading the correct directions by identified intervention condition)
   b. Timing of intervention condition:
      i. Time of entire intervention. Mark the **start time** when the student begins reading the passage the first time and mark the **end time** when the student finishes reading the passage the second time.
      ii. The student will read the entire passage, but put a bracket after **one minute** (student doesn't have to know) for the **first** and **second readings** just like in completing a CBM-R passage.
      iii. Mark the time it takes the student to read the entire passage the first time and the second time they read it. This will be **Total Time** (in minutes).
   c. Conditions include one of these per student:
      A – Control Condition
      B – Sound Prompt/1Sentence 1x
      C – Sound Prompt/Sentence 3x
      D – Word Modeling/Sentence 1x
      E – Word Modeling/Sentence 3x

Note. While student is reading through the passage and they lose their place or are skipping a line redirect them to the last word you heard them read.

6. Thank the student, give them a pencil, and take/send them back to class