CAUSAL COMPARATIVE STUDY OF STRUCTURED LITERACY KNOWLEDGE

BETWEEN PARTICIPANTS OF DYSLEXIA INTERVENTION

TRAINING PROGRAMS

by

Rhonda Alm

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Philosophy

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APPROVED BY:

Susan K. Stanley, Ed.D., Committee Chair

Amy Jones, Ed.D., Committee Member

ABSTRACT

The purpose of this quantitative causal-comparative study is to examine differences in structured literacy knowledge between dyslexia interventionists at the therapy level, the teaching or practitioner level and dyslexia interventionists with training with fewer requirements than the aforementioned. Reading scores across the United States continue to report high percentages of students who perform below proficiency levels despite the implementation of policies and procedures to mitigate this. Through using a multitiered system of services, students may qualify for dyslexia intervention provided by individuals specifically trained for such services. Although research studies have revealed a lack of structured literacy knowledge in preservice teachers and educators, little research informs the knowledge levels of those providing intensive reading intervention. This study comprised 94 participants from dyslexia intervention programs across the United States: 49 participants from the therapeutic level, 22 participants from the teaching or practitioner level, and 23 participants from dyslexia interventionist training programs requiring fewer requirements than the previously stated programs. All participants completed the Basic English Language Knowledge test, with the data applied to a one-way analysis of variance. Results indicated significantly higher knowledge of structured literacy from participants in the therapeutic level programs than the other two types of programs. Recommendations include subsequent research with larger sample sizes and studies to investigate student progress when receiving training from different levels of dyslexia intervention.

Keywords: dyslexia, dyslexia intervention, structured literacy knowledge, multitiered system of services

Dedication

This dissertation is dedicated to my Mom, Mary Evelyn Woodard, who has always been a fierce supporter of my learning endeavors. Thank you for demonstrating unconditional love and for guiding me through life with a biblical worldview.

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First and foremost, I owe everything to Jesus Christ, my rock and my salvation. There are many individuals God placed in my life who led and encouraged this level of educational endeavor, beginning with my family. I am grateful for the enduring patience and support of my husband, Bradley, my daughter, Kirsten, and my parents, Larry and Evelyn. There were also many individuals who mentored me during different stages of my life: Morton C. Cuplin, Paul A. Montemora, Mary "Skeet" Anderson, Rue Hatfield, Lisa Jacobs, Cissy Stubblefield, Tammy Koffard, Jeaninne Phillips, and Kay Peterson. They all encouraged me in different ways to pursue excellence even when I did not believe in myself. Special thanks to Debbie Goddard, my best friend, and Kirsten McAllister, my daughter, for being frank and honest editors. Much appreciation to my committee chair, Dr. Susan Stanley, and committee methodologist, Dr. Amy Jones, experts in the field of education who gave indispensable advice and always encouraged and prayed for me. It is evident that God's plan included learning from some great individuals who may not have known how much influence they had on my life. I am forever grateful.

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List of Abbreviations

Academic Language Therapy Association (ALTA)

Basic English Language Knowledge (BELK)

International Dyslexia Association (IDA)

International Multisensory Structured Language Education Council (IMSLEC)

Multitiered System of Support (MTSS)

National Assessment of Educational Progress (NAEP)

National Reading Panel (NRP)

Response to Intervention (RTI)

Simple View of Reading (SVR)

CHAPTER ONE: INTRODUCTION

Overview

The purpose of this quantitative, causal-comparative study is to examine differences in structured literacy knowledge between participants in different dyslexia interventionist training programs. Chapter One provides a background for the topics of reading instruction and dyslexia intervention training programs. The background includes an overview of the theoretical framework for this study, followed by the problem statement, which examines the scope of the recent literature on this topic. After the purpose statement, the significance of the current study is given. Lastly, the research question is introduced, and the definitions pertaining to this study are provided.

Background

According to recent reports from the National Assessment of Educational Progress (NAEP), approximately 60% of U.S. students in Grades 4, 8, and 12 perform below proficiency level in reading. The nation's difficulties with literacy rates of students are not a recent occurrence, as below proficiency scores have been reported for several decades despite the implementation of policies and programs (NAEP, 2020). A review of student and adult populations specific to reading difficulties gives further understanding of the nation's difficulties concerning low literacy rates. Of the students served in special education, one-third are identified with a specific learning disability (SLD), most notably in reading, and 96%-98% of SLD students in Grades 4, 8, and 12 perform below proficiency level (Fletcher et al., 2018; Horowitz et al., 2017; NAEP, 2020). Of the juveniles who connect with the court system, 85% are functionally illiterate, and within the prison population in the United States, as much as 60% of the population have been identified as functionally illiterate (Begin to Read, 2022; National Center for Educational Statistics, 2016).

In 1997, out of concern about continued low reading scores, the National Reading Panel (NRP) was formed at the request of the U.S. Department of Education and the National Institute of

Child Health and Human Development (NRP, 2000). Utilizing a panel of 14 members, the NRP

(2000) examined evidence-based research on effective reading instruction by reviewing over

100,000 research studies. The report specified the necessary components of reading and included

effective scientific, evidenced-based strategies for reading instruction. The importance of

systematic, sequential, and synthetic approaches was identified for successful reading instruction.

The report also identified the five pillars of reading: phonemic awareness, phonics, fluency,

vocabulary, and comprehension. Teacher education and support were noted in the findings,

indicating a need to ensure that appropriate instructional strategies are applied in the classroom.

Important to student progress is the ability of teachers to provide effective instruction.

However, studies have indicated a lack of knowledge regarding the basics of reading instruction as

informed by the NRP (Porter et al., 2022). Professional development has been identified as a

necessary and continual need for teachers to ensure continued support in the application of

structured literacy (Oliveira et al., 2019). Preservice teacher training has the potential to mitigate

ineffective reading instruction and help increase student reading achievement. The examination of

preservice teacher programs revealed reading methodology courses taught by professors who

themselves did not demonstrate knowledge of structured literacy instruction, and textbooks and

other materials held incomplete or inaccurate information (Cunningham, 2009; Joshi &

Wijekumar, 2020; Joshi et al., 2009; Oliveira et al., 2019). Preservice teachers graduated from

programs without knowledge nor understanding of how to implement the findings of the NRP

report (Cunningham, 2009). Improving student reading abilities begins with accurate and effective

structured literacy instruction knowledge by those who train preservice teachers, the developers of

teacher professional development, and the educators implementing interventions for students

identified with reading difficulties.

Since the publication of the NRP report, some schools have implemented a multitiered system of services (MTSS), sometimes referred to as a response to intervention (RTI), designed to assist with the early identification of struggling readers and the implementation of small group intervention strategies (Preston et al., 2016). Students not making progress through differentiated classroom instruction or small group intervention under RTI receive intensive intervention usually by specially trained individuals (Porter et al., 2022). Those individuals providing the intervention may have received training through several programs that vary greatly in cost, length of training, content, and completion requirements (Texas Education Agency, 2018; U.S. Department of Education, n.d.). Particular to reading, MTSS's lower tiers were designed to provide instruction to students applying structured literacy knowledge by the general education classroom teachers and to students who have given indications of the need for more specified and focused instruction, either with a whole class or in a small group. When a student does not respond to intervention, and depending upon the state, region, or district, students with significant reading struggles may be identified with an SLD in reading and/or dyslexia and may receive specific literacy instruction, such as dyslexia intervention. The process of MTSS allows school districts to adjust processes to meet student needs early. Unfortunately, findings have indicated a lack of consistency, fidelity, and efficacy from the implementation of MTSS, further indicating a need to continue an examination of teacher training and how differing levels of MTSS serve students, especially those serving students with SLD in reading or dyslexia (Gilbert et al., 2013; Shaywitz & Shaywitz, 2020). Porter et al. (2022) found differences in the knowledge levels between special educators and reading interventionists who provided services to students with reading disabilities. The study found reading interventionists demonstrated the greatest knowledge of literacy and the special education teachers scored lower than reading interventionists and general classroom teachers. The special education teachers participating in the study provided reading instruction to students with reading

disabilities, and the reading interventionists provided support for students in the general classroom, with the authors suggesting the reevaluation of not only needed training for special education teachers but also the reevaluation as to reading interventionists' role in the provision of services to students with reading disabilities. Some intervention programs provide a core scripted model of delivery, but a therapeutic model of intensive reading intervention allows for a more individualized program specific to a student's needs (Academic Language Therapy Association [ALTA], 2022; Education Service Center, Region 13, 2022). Variances between personnel who provide support for students with significant reading difficulties, such as dyslexia, suggest students may not be receiving structured literacy instruction by those who have the highest knowledge. Comparing types of dyslexia intervention training programs in relation to structured literacy instruction knowledge acquired through program participation gives information pertinent to effective reading intervention provisions. Understanding the knowledge and skill levels of those providing structured literacy instruction to students with significant reading difficulties has implications in the endeavors to increase reading skills in students, particularly the population that has less than a 5% rate of proficiency on national assessments (NAEP, 2020).

Historical Overview

Although structured literacy knowledge and skills by general classroom teachers have been found to be deficient, an investigation of knowledge levels of those who provide intervention to the large population of students identified with significant difficulties in reading has been mostly neglected (Moats & Foorman 2003). The largest population of students receiving special education are students identified with a learning disability in reading (Fletcher et al., 2018). RTI was established to help identify students at risk for reading difficulties early and lower the number of students later served through special education. Students identified early and who receive intense intervention have a greater ability to advance reading skills than those students identified later in

their educational career (Moats, 2017; Torgesen, 2000). Since the NRP report (2000) and policies such as No Child Left Behind (No Child Left Behind Act of 2001, 2002), identification and intervention have increased, along with a focus on helping teachers acquire the needed knowledge for instruction (Preston et al., 2016). Students identified with dyslexia or a learning disability in reading may be provided intervention, and the recommendations are for interventionists to be specially trained individuals (ALTA, 2022; International Dyslexia Association [IDA], 2022d; International Multisensory Structured Language Education Council [IMSLEC], 2022). The growth of research in the area of reading instruction is commendable and provides insight into research-based practices for improving reading for a large majority of students. However, the focus of the research literature has mainly centered on student assessment, progress, and intervention type rather than on the knowledge level of interventionists as a potential concern for student success. Specifically, the knowledge level of dyslexia interventionists with consideration to their training levels has not been investigated. For coherence, the term dyslexia will be the focus and term used for further content, as the intervention to serve students with SLD in reading or students with significant reading difficulties are often served by the same personnel.

The term dyslexia has origins beginning with medical professionals such as Broca (1861) and Wernecki (1894) who identified intra-individualized strengths and weaknesses, expressive or receptive aphasia, in individuals with lesions in particular areas of the brain but otherwise with intact cognitive function (Fletcher et al., 2018). Observing patients with intact intellect and perceptual skills, Kussmaul (1877) noted the unexpectedness of reading difficulties he referred to as "word blindness." In a review of dyslexia's historical perspectives, Richardson (1992) wrote about the early contributors to the understanding of dyslexia from the 1800s to the current researchers. The report described such historical figures as Berlin (1883), an ophthalmologist who used the term dyslexia to describe a form of aphasia for individuals having great difficulty with

reading in conjunction with acquired impairments or disease in the brain. The physician W. P. Morgan (1896) was discussed through the contribution of publishing the first article in a medical journal on word blindness, referring to adults who had difficulties with language skills that were hypothesized to be from brain impairment. Later, in 1917, the Scottish ophthalmologist Hinshelwood published literature that made an effort to explain symptoms, establish a scientific diagnosis, and relate the ability to remediate students with persons of proper training. The conversation of being able to remediate individuals with reading difficulties is significant in its contribution to current research and development of intervention training.

Samuel T. Orton (1925) was the first to report information on word blindness in an American medical journal, and he was the first to emphasize the importance of language as an integration of listening, reading, writing, and oral communication (Richardson, 1992). Orton (1925) emphasized the treatment of dyslexia as best being served in educational settings, with the use of sound-symbol associations taught through multisensory methods. Fletcher et al. (2018) stressed the importance of Orton's influence on the identification of a cerebral dysfunction rather than a brain lesion in students with average to above-average intelligence with significant reading difficulties, and the ability to assess and identify. Orton was also noted as extremely influential in the growth of research, and the encouragement of parent and teacher organizations, such as the IDA, initially founded as the Orton Society in 1949 (IDA, 2022b).

Later, support of Hinshelwood and Orton came from Geschwind (1982) who emphasized dyslexia as significant language difficulties stemming from developmental delays in the brain's language areas. Other important figures in the history of dyslexia include Jeanne Chall, Margaret Rawson, Marilyn Adams, Joseph Torgesen, and Bennett and Sally Shaywitz. Working with the support and backing of the Carnegie Corporation, Jeanne Chall (1996), a prominent educational psychologist and researcher, reviewed the research literature and reading curricula and observed

and interviewed classroom teachers, synthesizing the information into her pinnacle work, *Learning to Read: The Great Debate* (Chall, 1996). She found early systematic phonics instruction resulted in better word recognition, spelling, vocabulary, and reading comprehension. Chall (1983) was also noted for her legacy of the design and definition of reading stages and the need for explicit instruction in the remediation of reading difficulties. A sound-symbol basis of instruction was supported by Chall who also identified the difficulties that poverty and environment played in students' reading development. Despite the strong emphasis on whole language instruction at the time, Chall advocated for systematic phonics instruction and the training needed for effective reading instruction. At approximately the same time as Chall's initial investigative and historical research review on reading instruction sponsored by Carnegie Corporation, the U.S. Office of Education sponsored a review of the current research on first-grade reading (Chall, 1999). The review of the historical and current research had similar findings: Phonics instruction increased reading skills, and other components, such as language skills, appropriate instructional materials, and quality, effective teaching, were also important to reading success.

Margaret Rawson continued the support for systematic instruction and emphasized its need to be cumulative, sequential, multisensory, and therapeutic (Rawson, 1986, 1995). Rawson began her career in the field of dyslexia after discovering the work of Orton as she helped a young student who had great difficulties with reading (Leong, 2002). One of the longest longitudinal studies of students with dyslexia—over 50 years—was completed by Rawson, giving great depth to the field of dyslexia (Rawson, 1995). She was recognized for her service as a clinical psychologist, the author of many papers, articles, and books, and for her devotion to the diagnosis and remediation of dyslexia.

An important researcher following Chall and Rawson was Marilyn Adams, who also supported not only reading development stages but also the need for combining word recognition

and word meaning within instruction. A summary of Adams's 1990 seminal work, *Beginning To Read: Thinking and Learning About Print*, highlighted Adams's review of more than 600 pieces of literature and her development and description of reading development stages that included phonological awareness, print recognition, decoding, fluency, spelling, and writing (Stahl et al., 1990). Also of note was her support of the need for knowledgeable reading instructors. She once stated, "Effective reading instruction depends not only on what one does, but also on the depth and quality of the understanding by which it is guided" (Adams, 1990, p.123). Her work patiently and succinctly explained the necessary stages of reading and the components of reading instruction for educators and administrators.

Further developing the understanding and support of dyslexia was Joseph Torgesen, a prominent researcher in the field of dyslexia and reading instruction who helped develop diagnostic assessments for dyslexia and helped establish the Florida Center for Reading Research in 2002 (Torgesen, 2012). The Florida Center for Reading Research continues to conduct research into reading and reading instruction and provides information to educators on research-based practices. The history of dyslexia began through medical understanding to the involvement of educational psychologists and others in examining and advocating for effective instructional strategies and teacher training. Dyslexia has emerged from the belief of language difficulties specifically caused by disease or injury to the understanding of differing brain functions that assist or impede reading skills, and how structured, systematic instruction of the components of reading can positively affect reading abilities (Morgan, 1896; Shaywitz et al., 2006).

Dyslexia is a term that has evolved through many years of research and is currently recognized by the following definition:

Dyslexia is a specific learning disability that is neurobiological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and

decoding abilities. These difficulties typically result from a deficit in the phonological

component of language that is often unexpected in relation to other cognitive abilities and

the provision of effective classroom instruction. Secondary consequences may include

problems in reading comprehension and reduced reading experience that can impede

growth of vocabulary and background knowledge. (IDA, 2022a, *Definition of dyslexia*

section)

Using functional magnetic resonance imaging (fMRI), research has demonstrated

differences in language processing in the left hemisphere of individuals who had difficulties

reading (Shaywitz & Shaywitz, 2005). Research using fMRI led to the formation of a

neurobiological origin definition of dyslexia (Shaywitz et al., 2006). The NRP report gave

evidenced-based reading instruction strategies based upon research using fMRI and other studies

examining research-based teaching strategies (NRP, 2000; Shaywitz et al., 2006). Specific and

necessary components of reading skills instruction were identified as the five pillars of reading and

included phonemic awareness, phonics, fluency, vocabulary, and comprehension (NRP, 2000).

Despite research to indicate necessary components and effective strategies for reading instruction,

MTSS continues to be delivered inconsistently by preservice teachers, classroom teachers, and

special education teachers with knowledge deficits (Cohen et al., 2017; McMahan et al., 2019;

Porter et al., 2022). Research has shown inconsistent results from intense reading intervention

instruction, but an investigation into interventionists' structured literacy instruction knowledge as a

potential factor has obtained limited investigation (Balu et al., 2015; Porter et al., 2022).

Federal and state law guides schools regarding requirements for identification and services

to students with dyslexia or SLD in reading, and district policies lead administrators and other

decision-makers to the available dyslexia intervention programs and the training program

requirements (Individuals with Disabilities Education Improvement Act, 2004; Texas Education

Agency, 2018; U.S. Department of Education, n.d.). IMSLEC, an accrediting agency, purposes to identify quality dyslexia training programs at either a teaching or therapeutic level of training (IMSLEC, 2022). Within the list of accredited programs, the teaching level programs require 45 hours of instruction, 60 practicum hours, and five observations; the therapy level requires 200 instructional hours, 700 practicum hours, and 10 observations. The ALTA and the IDA certify individuals who have completed a dyslexia intervention program at either the practitioner (designated as the Teaching level under IMSLEC guidelines) or therapy level, adhering to the same requirements as IMSLEC.   (ALTA, 2022; IDA, 2022d). Other dyslexia training programs require as few as five to nine days of training for completion (Education Service Center, Region 13, 2022). Variances in training and training requirements may impact levels of structured literacy instruction knowledge, potentially affecting student achievement levels.

Society-at-Large

Reading ability is a skill that affects an individual's potential productivity as a citizen. Reports indicate approximately one in five students have dyslexia and over 60% of the nation's students are reading below proficiency level (Horowitz et al., 2017; NAEP, 2020). Other statistical evidence magnified the continued reading difficulties in the United States, reporting approximately 85% of juveniles interfacing with the court system as illiterate, and more than 60% of prison inmates being functionally illiterate (Begin to Read, 2022; National Center for Educational Statistics, 2016). Morken et al. (2021) suggested educational opportunities and reading intervention have implications for a positive and productive citizenry. Regardless of current research and program initiatives for improving student reading achievement scores, the NAEP reports indicated no significant changes in reading achievement levels since 1990 (NAEP, 2020). Implications to employment prospects, quality of life, and effects on society at large are inferred from the low levels of reading abilities in the nation's citizens. Given the research findings of overall poor

reading abilities within schools and society, understanding what types of dyslexia intervention training programs best prepare individuals in systematic instruction using structured literacy knowledge informs administrators, policy makers, and other stakeholders.

Theoretical Backgrounds

In 1986, Gough and Tunmer presented a model for understanding reading, emphasizing reading as an outcome of two necessary components: decoding and linguistic comprehension. A simple formula, D x C = R, was devised and presented, where decoding was denoted as D, linguistic comprehension as C, and the skill of reading as R. The formula for understanding reading was called the simple view of reading (SVR). To accomplish the product of reading, both decoding skills and linguistic comprehension were notated as the two necessary components. SVR defined decoding as the skill of applying letter-sound correspondence accurately, quickly, and silently, to words in isolation. Gough and Tunmer further clarified SVR with the definition of linguistic comprehension as the ability to interpret word information, sentences, and discussions in oral form. Prediction of reading ability using SVR was obtained through the measurement of decoding and listening comprehension, giving a product of reading comprehension ability. SVR further asserted reading difficulties stemming from one of three ways: poor decoding, poor comprehension, or both. The SVR proposed the product of reading necessitates both abilities of decoding and linguistic comprehension.

Research after the introduction of SVR affirmed the model and further expanded the understanding and applications (Lonigan et al., 2018; Protopapas et al., 2012; Tilstra et al., 2009). Further explanations of SVR identified decoding as a print-dependent component with the usefulness for decoding words and nonwords, and linguistic comprehension as a print-independent skill with correlations to oral vocabulary (Protopapas et al., 2012). Other research identified the differences in component strengths associated with grade level (Lonigan et al., 2018; Tilstra et al.,

2009). The findings supported the conclusion of stronger decoding with lower comprehension in younger students and lower decoding with stronger comprehension in older students. As decoding abilities are strengthened and increased fluency occurs, older students begin to rely less on decoding and more on fluency and comprehension skills. Lonigan et al. (2018) further suggested predictive values of SVR, where decoding predicts reading comprehension in younger children.

The ability to apply SVR to assessment and intervention includes the consideration of students who have previously been identified as nonresponders or poor readers. Sleeman et al. (2022) supported the use of cluster analysis to minimize limitations, with more students fitting the three SVR reading difficulties. The use of SVR and cluster analysis categorizes most students with one of the reading difficulties and eliminates the supposition of nonresponders to intervention, allowing a greater specification as to needed intervention instruction. The use of cutoff scores in traditional analysis negated the continuum of student reading difficulties and thereby established limitations through cutoff scores and adding a fourth category of nonresponders. Students on a continuum of reading difficulties in either decoding, linguistic comprehension, or mixed difficulty groups could be assigned to specific, targeted interventions using cluster analysis and select assessments (Roberts & Scott, 2006; Sleeman et al., 2022). Application of SVR implicates the quality level of intervention and the ability of interventionists to understand the product of reading and how to effectively target instruction to meet each student's needs.

Scarborough (2001), separate and independent from Gough and Tunmer, similarly described reading as the combination of two main components: language comprehension and word recognition. Within each of the components were several intertwined subcomponents. The language comprehension strand consisted of subcomponents identified as background knowledge, vocabulary, language structures, verbal reasoning, and literacy knowledge. The strand of word recognition consisted of the subcomponents of phonological awareness, decoding, and sight word

recognition. Sight word recognition is the instantaneous recognition and reading of words that do not follow standard phonetic spelling rules or high-frequency words. Scarborough visualized the components and the subcomponents as strands of a reading rope, where the interaction of simultaneous intertwining instruction developed skilled reading (see Appendix A). The reading rope gives an explanation and visualization consistent with SVR while describing the necessary and complex interactions of the subcomponents. Structured literacy knowledge is developed through the understanding of the simple yet complex components of reading.

Problem Statement

Research has indicated significant reading difficulties require systematic, explicit, and direct instruction (Moats, 2020). Although there is substantial research focused on reading, teacher knowledge of reading instruction, dyslexia, and reading intervention, the structured literacy knowledge level of dyslexia interventionists has not been addressed (IDA, 2022c; NRP, 2000). Some studies have offered an examination of diverse types of dyslexia intervention training without addressing the effectiveness or knowledge and skill levels of interventionists (Stevens et al., 2021; Tilanus et al., 2020). Studies have indicated a lack of proper preservice teacher knowledge and practicing of the necessary components of reading and application to MTSS intervention but have lacked an examination of reading interventionist's knowledge (Gonzalez, 2020; Moats, 2020; Oliveira et al., 2019). Porter et al. (2022) indicated a need for further research to determine the knowledge levels of those providing intensive intervention to struggling readers. McMahan (2019) identified a need for further research and the examination of intervention programs that serve students with significant reading difficulties. The problem is research literature does not fully address the knowledge of structured literacy by those providing intensive dyslexia intervention trained through different types of programs.

Purpose Statement

The purpose of this quantitative causal-comparative study is to investigate structured literacy knowledge levels from individuals who have received training at the therapy level, teacher or practitioner level, or other types of programs with fewer completion requirements. McMahan et al. (2019) informed the need for assessing English literacy knowledge by those providing reading intervention. McMahan et al. (2019) reported that those individuals who participated in rigorous 2-year intervention training programs and pursued further training performed significantly higher than others. To investigate levels of structured literacy knowledge, this study will focus on different types of intervention training programs and their effect on structured literacy knowledge levels. The establishment of independent and dependent variables, as defined by Gall et al. (2007), includes the independent variable of a dyslexia intervention training program consisting of three groups: therapy level training, teacher or practitioner level training, or other types of training program. The dependent variable of structured literacy instruction knowledge will be assessed through participants' completion of the Basic English Literacy Knowledge test (McMahan, 2019). Participants reside in the states of Kansas, Mississippi, North Carolina, and Texas and minimally hold a bachelor's degree, with two or more years of teaching experience. The use of a one-way analysis of variance (ANOVA), as supported by Gall et al. (2007), will compare and examine whether statistically significant differences in structured literacy knowledge exist between participants at the therapy level, the teacher or practitioner level, and other types of intervention programs.

Significance of the Study

Studies have demonstrated a lack of literacy instruction knowledge by general educators without addressing the knowledge level of dyslexia interventionists (McMahan et al., 2019; Porter et al., 2022). The necessary components of structured literacy knowledge have been identified,

allowing the ability to assess levels of knowledge (Gough & Tunmer, 1986; McMahan, 2019; Scarborough, 2001). Along with federal law and policies to identify students with reading disabilities early, many states have formulated policies and procedures to identify students and provide intervention services (Individuals with Disabilities Education Improvement Act, 2004; McMahan et al., 2019; Texas Education Agency, 2018). Despite policies and procedures, national reading scores continue to indicate approximately 60% of the nation's fourth-, eighth-, and 12th-grade students lack proficiency skills in reading (NAEP, 2020). Reports on adult literacy have indicated the prison population's high illiteracy numbers (National Center for Educational Statistics, 2016). Understanding dyslexia training programs and differences and identifying the types of programs that lead to greater knowledge of structured literacy and systematic literacy instruction has implications for future research in effective dyslexia intervention and has the potential to impact overall student reading achievement levels on national assessments. The provision of intervention services for students with dyslexia has not specifically addressed the structured literacy knowledge of individuals from different types of dyslexia intervention training programs (McMahan, 2019). This study will add to the body of literature on dyslexia intervention by examining the causal-comparative relationship between types of training programs and structured literacy knowledge. Research specific to the differences in therapeutic levels of dyslexia intervention and nontherapeutic programs allows school districts to select programs that best prepare dyslexia interventionists. Knowledge levels can be indicators of implementation abilities in dyslexia intervention and further guide future research into therapeutic models of dyslexia intervention training.

Research Question

RQ1: Is there a difference in structured literacy knowledge between dyslexia interventionists with therapy-level training, teacher- or practitioner-level training, or other types of dyslexia interventionist training?

Definitions

1. *Academic language therapy* (ALT) – multisensory, direct, explicit, and structured instruction for students with dyslexia or learning disability in reading, implemented in an individualized therapeutic manner (ALTA, 2022).

2. *Comprehension* – To read fluently and understand meaning is the foundation of reading comprehension (NRP, 2000). According to SVR, reading comprehension is acquired through the two necessary components and subcomponents of decoding and linguistic comprehension (Gough & Tunmer, 1986; Scarborough, 2001)

3. *Dyslexia* – a neurobiological disorder that affects several areas of language and is not due to other forms of disabilities or other exclusionary factors (IDA, 2022a).

4. *Fluency* – the ability to read accurately, quickly, and with prosody (NRP, 2000).

5. *Multitiered system of services (MTSS)* – a tiered level of instruction that allows educators to provide differentiated instruction in the classroom, small group intervention, or the need for intensive intervention provided by other qualified individuals (Preston et al., 2016).

6. *Phonemic awareness* – While phonemes are the smallest unit of sound, phonemic awareness is the ability to recognize spoken phonemes and manipulate them (NRP, 2000).

7. *Phonics* – Phonics instruction includes alphabetic knowledge and the ability to connect sound to symbols (NRP, 2000).

8. *Vocabulary* – The ability to understand word meanings is the function of vocabulary (NRP, 2000).

CHAPTER TWO: LITERATURE REVIEW

Overview

The purpose of this literature review is to present foundational components for understanding reading instruction, preservice and teacher preparedness, intervention models, and training of interventionists for the provision of dyslexia therapy. The chapter begins with the theoretical framework, focusing on the SVR and Scarborough's reading rope applied to structured literacy instruction and interventionist training (Gough & Tunmer, 1986; Scarborough, 2001). Historical perspectives on reading instruction and dyslexia will be provided. Reading acquisition skills, teacher training, and dyslexia intervention will be discussed in relation to structured literacy instruction knowledge and skill acquisition. The chapter ends with a summation of the literature review.

Theoretical Framework

According to theoretical frameworks presented by Gough (1972), Chall (1983, 1996), and Stanovich (1982), reading is based on an alphabetic system and the construction of graphemes and phonemes that are learned from a method of decoding and encoding, giving meaning to print. The National Reading Panel conducted an extensive review of research on effective reading instruction practices, identifying five key areas of reading abilities: phonemic awareness, phonics, fluency, vocabulary, and comprehension (National Reading Panel, 2000). Each component, according to the NRP report, is important to successful reading; many researchers specify the necessity of phonological awareness and the subcomponent of phonemic awareness (Cunningham et al., 2001; Moats, 2020; Rehfeld et al., 2021). Before the release of the NRP, Gough and Tunmer (1986) presented their SVR framework. The SVR states that reading comprehension is the product that occurs from reading instruction and is acquired through the necessary skills of decoding and language comprehension. Reading comprehension is hence hindered if one or both of the skills are

deficient. Poor readers, those with significant reading comprehension difficulties, struggle with some variables of decoding, language comprehension, or both (Sleeman et al., 2022). SVR purports poor readers have significant difficulties in decoding or language comprehension or a combination of both, but some researchers indicated some students fit a fourth profile of poor readers, having deficits in reading comprehension without significant difficulties in either decoding or language comprehension. Consideration of data analysis identified the use of traditional analysis methods where researchers selected cutoff points for significant difficulties and, therefore, generated what appeared to be a fourth profile of poor readers. Using cluster analysis and viewing poor readers through the lens of a continuum of diverse readers, poor readers were placed into the SVR's three reader profiles. Sleeman et al. (2022) confirm Gough and Tunmer (1986) and support the use of cluster analysis to help delineate where poor readers struggle the most, allowing greater focus on the instructional and intervention needs of students. The importance of obtaining proper profiles is magnified when traditional analysis methods generate a profile of students with established cutoff points for significant decoding or language comprehension skills, potentially leaving some students to be not supported with proper instruction. The use of cluster analysis methods confirmed SVR and helped reveal a more focused understanding of student strengths and weaknesses. Understanding the underpinnings of reading comprehension difficulties informs instructional and intervention methods.

Scarborough (2001) further highlighted the need for understanding each student's strengths and weaknesses for proper intervention. Scarborough is recognized as a psychologist, literacy expert, and the originator of a simple visual to describe the complexity of reading acquisition. In describing the components and subcomponents of reading, Scarborough presented a rope design, where the intertwining of each component and subcomponent worked together to form strong reading comprehension (see Appendix A). Within the structure of the reading rope are two main

components, language comprehension and word recognition, which align with SVR's components of language comprehension and decoding. Within Scarborough's language comprehension component are five subcomponents: background knowledge, vocabulary, language structures, verbal reasoning, and literacy knowledge. Each language comprehension subcomponent focuses on aspects of oral and written language that give meaning. The word recognition component of the reading rope is subdivided into three subcomponents: phonological awareness, decoding, and sight recognition, of which phonological awareness includes phonemic awareness and decoding, which is a necessary component within SVR. With the increased strategic and automatic functioning of each component and subcomponent skill, students develop fluent word reading and comprehension of text. The visual depiction of each component and subcomponent allows a better understanding of the intricacies of learning to read and how important it is to have knowledge of each area to deliver effective instruction.

The application of SVR to dyslexia intervention training provides the theoretical support for strong intervention including the necessity of explicit, structured, systematic, direct, and multisensory instruction prescribed by the ALTA (2022) and the IDA (2022d). In addition, Scarborough's reading rope helps to identify the critical components of both language and word recognition, where separate and definitive subcomponents are woven together through explicit instruction, allowing for the synthesis of structured English language in learning to read (Scarborough, 2001). Scarborough's rope supports the need for the knowledge of structured language instruction, especially for those who struggle with learning to read. Fluency and reading comprehension are facilitated through the explicit and systematic instruction of each subcomponent. Through the lens of both SVR and Scarborough's reading rope, the understanding of the importance of strong knowledge in structured language instruction is manifested.

Related Literature

The concern over low reading achievement levels across the United States prompted the investigation and examination of reading instruction, teacher preparation, and intervention (Moats, 2020; NRP, 2000; Peltier et al., 2022; Schlesinger & Gray, 2017). Studies completed years before the NRP report, and the studies completed after the report were consistent in the identification and significance of the reading components to the acquisition of effective reading comprehension skills (Austin et al., 2022; Chall,1983; Gough, 1972; Gough & Tunmer, 1986; NRP, 2000; Vollegregt et al., 2021). Recently, the terms science of reading and structured literacy instruction have been used to reference the research and application of systematic, hierarchal skills for reading that lead to reading comprehension abilities (IDA, 2022d; Spear-Swerling, 2019). Both structured literacy instruction and the science of reading incorporate the NRP report's five pillars (components) of reading: phonemic awareness, phonics, fluency, vocabulary, and reading comprehension (NRP, 2000). Each component of reading needs consideration for the effective instruction of reading skills.

The phonological processing area of the brain has been identified as a common area of deficiency in individuals with dyslexia, affecting speaking, reading, and spelling (Shaywitz & Shaywitz, 2020). The NRP's five pillars include phonemic awareness, a subcomponent of phonological awareness, where the identification and manipulation of individual phonemes, the smallest unit of sound, occur. Some researchers focus on the overarching phonological awareness concepts that include syllables, onset-rime and rhyme, and phonemic awareness, lending itself to the progression of phoneme-grapheme connections needed for reading (NRP, 2000; Shanahan, 2021). In a longitudinal study, Lefevre et al. (2023) confirmed phonemic awareness difficulties in students with dyslexia and identified the accuracy and speed of phonemic discrimination and segmentation as determining factors for identification. Differentiated instruction and intervention

were found to provide greater progress when phonemic awareness instruction was provided early and showed the greater importance of phonemic awareness over phonological awareness in early years (Rehfeld et al., 2021). Instruction that is provided explicitly and systematically promotes not only growth in phonemic awareness but also provides the preparational skills needed to develop automaticity in decoding and increased fluency skills, but the intensity of intervention has also been found to be of critical importance (Clayton et al., 2020; Rehfeld et al., 2021; Shaywitz & Shaywitz, 2020). Some studies have shown phonemic awareness instruction along with letter-sound connections and rapid automatic naming (RAN) appeared to be causally related, which helps to understand the necessity for interventions that focus on the entire student's struggles rather than focusing on singular components (Clayton et al., 2020). Focusing on all five of the reading components builds, in a systematic manner, the ability to read and comprehend. Of concern is how phonemic instruction is implemented and whether knowledge will produce the appropriate skill level needed for assessment, identification, and implementation of reading instruction and intervention, especially at the younger grade levels.

Phonics instruction relates to the symbol/sound connections and phonemic awareness is applied to the sound/symbol relationship, leading to reading and spelling skills (NRP, 2000). Phonics is the beginning of decoding and builds from graphemes and phonemes to syllable types. The importance of structured, systematic phonics was iterated within the NRP, indicating the print-to-speech process is to be taught sequentially and explicitly (NRP, 2000). Whereas decoding is letters to sound, spelling is the encoding of sounds to letters. Spelling interventions and the incorporation of semantics have been found successful in the increase of reading fluency when systematically employed (Galuschka et al., 2020; van Rijthoven et al., 2021). The focus on structured and systematic instruction and intervention was recommended by the NRP, not singling out synthetic, analytic, or analogic phonics. Synthetic phonics refers to part-to-whole instruction,

looking at individual phonemes and blending them to form words, while analytic phonics is taught whole-to-part, decomposing familiar words, and finding patterns when viewing similar whole words. Analogic phonics relates to instruction using words taught by rote and identifying onset or rime to find similarities in other words. The Rose Report in England, similar to the NRP report in the United States, specified the use of synthetic phonics, and teachers were mandated to use reading instruction methods focused on the coding first approach (Department for Education and Employment (DfEE) and the Qualifications and Curriculum Authority, 2013, Rose, 2006). For most students, especially those with dyslexia and younger students, an instructional approach that begins with the alphabetic principle and phonemic awareness is the pinnacle of phonics instruction. Phonics instruction also begins with the educator's understanding of the strategies involved, including alphabet knowledge, letter-phoneme connections, and decoding and encoding skills (Lane et al., 2022). The ability to increase processing speed in decoding and word recognition through phonics instruction allows the development of fluency and reading comprehension. Phonics applied in an explicit, structured, systematic, and intensive manner provides effective intervention for struggling readers.

Fluency occurs when the automaticity of decoding occurs in such a manner as to read quickly, accurately, and with prosody (NRP, 2000; Shanahan, 2021). Individuals begin by decoding and reading single words quickly and moving into the fluent reading of phrases and sentences. Some students may present adequate phonemic awareness and general phonics skills but have large deficiencies in fluency. Instruction that focuses on word and sublexical reading has been shown to improve fluency, supporting an explicit approach to phonics instruction and providing positive growth in students with fluency deficits (Metsala & David, 2021). The overarching reading component of phonological awareness, which includes rhyme, syllable division, and morphology, as well as phonemic awareness, plays a critical role in developing the skills needed

for fluency. Metsala and David (2021) found that word- and sublexical-focused intervention resulted in significant gains in fluency skills, and reading comprehension difficulties were fully remediated. NRP's initial components of phonemic awareness and phonics strongly influence fluency and reading skills. A focus on the acquisition of other reading skills positively impacts fluent reading versus the use of speed activities using words or text. Research suggests that reading instruction must incorporate active involvement in practicing reading to increase fluency (NRP, 2000). Once a student can read unhindered by decoding difficulties and word meanings are made known through linguistic comprehension, reading comprehension abilities increase. As SVR indicates, the necessity of both decoding and linguistic comprehension leads to reading comprehension, and decoding skills to the point of reading fluently implicates the ability for increased reading comprehension skills.

For the instruction of vocabulary, the study of word meaning, morphology, and semantics builds vocabulary skills in students, allowing a greater breadth of academic literature acquisition. Direct and indirect instruction along with repeated exposures lends itself to increased vocabulary skills (NRP, 2000). Scarborough's reading rope includes vocabulary as a critical component for language comprehension (Scarborough, 2001). The additional instruction of semantics, syntax, inference, and metaphors adds to the exposure and instruction of vocabulary in helping students with dyslexia develop strong language comprehension skills needed for reading comprehension. Farris et al. (2021) investigated the connection of morphological awareness and vocabulary instruction to reading resiliency and comprehension. The study of morphology, the meaningful units of words, has a direct connection to vocabulary acquisition, which is important for success in academic settings. Combined, morphology and vocabulary instruction have positive effects on reading comprehension. Students who are resilient readers can compensate for word-level reading difficulties, increasing their reading comprehension capabilities through their morphology and

vocabulary capabilities. Although there is a need to strengthen phonemic awareness and phonics, the ability of students to maintain content-level reading requirements is supported by their ability to understand units of meaning in words and vocabulary. Ellerman and Oslund (2019) pointed out that vocabulary instruction is best improved through implicit exposure along with systematic instruction of academic vocabulary connected with such strategies as morphology instruction. Explicit instruction alone limits the amount of vocabulary needed for future academic encounters. Repeated exposure over time and through many types of texts is needed for vocabulary development.

Humans are born with the ability to communicate orally but must learn to connect print to sound. Stanley (2022) stipulates early oral language skills are a determining factor in later reading abilities, noting the time spent in oral conversations is directly related to later abilities. Rather than listening alone, the act of conversing, the development of expressive language, helps to build vocabulary, with the needed goal of 4,000 to 5,000 vocabulary words, along with basic structuring of meaningful oral content by the time a child enters school. Other aspects of early language connected to later reading ability include exposure to print and books. Parents who read to their children allow interaction with rich vocabulary and knowledge of differing content areas. Actively engaging children in oral communication, exposure to print, and developing conversational discussions helps to build strong foundations for successful reading skills in the future.

The SVR postulates the necessity of decoding and linguistic comprehension skills for reading comprehension ability (Gough & Tunmer, 1986). The Scarborough reading rope further describes the components of decoding and linguistic comprehension as necessary for reading comprehension (Scarborough, 2001). Reading is a complex task and requires the combined skills of phonemic awareness, phonics, fluency, and vocabulary to affect reading comprehension. The ability of schools, teachers, and interventionists to understand and implement the identified reading

components begins with how teachers and others are themselves prepared in college and university teacher education programs.

Preservice Teacher Training and Teacher Preparedness

Preservice teacher training programs, particularly those programs that train for early education and lower elementary education, provide the knowledge and skills for effective reading instruction. Yet, research literature indicates great disparities in the types of reading instruction methods, the knowledge of those teaching preservice teachers, and the materials used. Despite the evidence for the effectiveness of explicit, structured, and systematic instruction of reading, with the implementation of the NRP reading components and strategies, universities have been found to use whole language or balanced literacy approaches along with the use of incomplete or incorrect content (Clark et al., 2017; Joshi et al., 2009; Meeks et al., 2016; Peltier et al., 2022). Some university textbooks used for preservice training programs held inaccuracies and omissions, with as few as 4% of textbooks examined addressing NRP information and recommendations (Joshi et al., 2009). In the same study, one textbook used by 91 universities omitted phonemic awareness and fluency entirely. The negative effect of inadequate reading instruction training on teacher knowledge and instructional practices has been highlighted by research investigating preservice teacher training programs (Eller & Poe, 2016; Hikida et al., 2019; Hurford et al., 2016; Joshi et al., 2009; Peltier et al., 2022; Purvis et al., 2016). Without effective and accurate content within preservice training, reading instruction is impeded, leading to potential and revealed low reading achievement skills by students.

Levels of self-confidence compared to actual knowledge and skills of preservice, new, and veteran teachers were also evidenced through research studies. Veteran teachers expressed less confidence in their preparedness to teach phonological awareness, and phonics particularly, than new teachers, indicating some recent improvement in preservice teacher training (Eller & Poe,

2016; Pittman et al., 2022). However, when assessed, preservice teachers, despite the number of methods courses taken and reported high levels of confidence, had low levels of reading instruction knowledge (Cohen et al., 2017; Suarez et al., 2018). Wider ranges of confidence levels were recorded from educators for knowledge and skills of phonological awareness and phonics compared to other reading components and overall confidence levels (Ciampa & Gallagher, 2021; Eller & Poe, 2016). The confidence level differences align with the reports of lower amounts of instruction in student classrooms for phonological awareness and phonics (Hikida et al., 2019; Meeks et al., 2016). Evaluation of studies revealed the quality of coursework, with content and structure supported by evidenced-based reading instruction practices, led to higher levels of knowledge and confidence (Clark et al., 2017; Hudson et al., 2021). Additionally, higher levels of reading instruction and skill levels were found by preservice and veteran teachers who participated in quality instruction and coursework.

Not only have there been disparities in the number of courses and content of preservice teacher training programs in reading instruction, but research has also indicated the lack of and need for more experiences in assessing and identifying students with reading struggles (Flynn et al., 2021; Hurford et al., 2016; Meeks et al., 2016). The ability to identify reading difficulties in students and differentiate instruction allows for the application of early intervention necessary for improved reading skills in students. Researchers have recommended intensive coursework, practicum experiences with diverse levels of readers, as well as new teacher mentorships and ongoing professional development to increase effective reading instruction (Amendum & Fitzgerald, 2013; Eller & Poe, 2016; Feng et al., 2019; Flynn et al., 2021; Hudson et al., 2021; Hurford et al., 2016; Purvis et al., 2016; Scarparolo & Hammond, 2018; TeKippe, 2017). Problem-based learning was explored by TeKippe (2017) as a means to increase the retention of knowledge in reading methodology courses, evolving from lecture time to added professional learning

experiences. The experiences of defining and analyzing a problem, formulating goals, and implementing solutions indicated strong effective learning experiences. The experiential course structure was identified as an effective but highly planned, prepared course. In addition to the provision of extensive and intensive coursework in the science of reading, and experiential coursework and practicums, the need for continued connections between university preservice training programs and teacher experiences has also been identified (Feng et al., 2019). Mentorship programs for first-year teachers and ongoing professional development can increase self-efficacy and productive instruction. The research has reinforced the use of ongoing support for teachers, impacting improvement and assurance of evidence-based reading instructional practices being continually applied (Amendum & Fitzgerald, 2013; Feng et al., 2019; Scarparolo & Hammond, 2018). On-going professional development and mentorship programs are considered important to the effective instruction of reading, providing the types of materials and methods that align with the NRP report and subsequent research in reading.

Studies have revealed preservice and current teachers who exhibited the ability to understand and use reading skills themselves were capable of learning evidence-based reading instruction strategies (Hurford et al., 2016). Having the capability to read and demonstrate skills with all components of reading provides a solid foundation for being able to understand the intricacies of each component and how they are to be taught along with strategies to reach all learners. Teachers have diverse levels of students within each classroom and the ability to understand the content and reading instructional strategies appropriate for differing difficulties positively affects instruction outcomes. The use of standards for identifying and assessing knowledge and skill levels for structured language instruction may allow for focused direction in remedying poor levels of reading instruction. Given the disparities within preservice teacher training programs, and the lack of continued support for teachers throughout each year, guidance

for what constitutes standards for teacher training is an area in need of investigation. Such entities as IDA, ALTA, and IMSLEC provide some guidance for establishing standards for classroom teachers and other educational entities who provide intervention to struggling readers (ALTA, 2022; IDA, 2020c; IMSLEC, 2022).

In 2010, several key researchers in the field of dyslexia and structured literacy instruction worked to develop the IDA's *Knowledge and Practice Standards for Teachers of Reading* (KPS) (IDA, 2022d)*.* The authors proposed a college course dedicated to applying the IDA standards to the college course curriculum to ensure structured literacy instruction knowledge and skills were taught and developed. IDA recognized the disparities in university teacher training programs for reading instruction, teacher, and interventionist preparedness, and developed the standards to also guide intervention preparation programs and professional development. Similar to ALTA and IMSLEC, the IDA standards were designed to build stronger and standardized qualification guidelines for training individuals in structured literacy instruction. Informing policy makers, guiding university preservice teacher training programs, supporting dyslexia intervention training programs, and educating teachers, administrators, and other stakeholders on what constitutes structured literacy instruction knowledge, increases the potential for improving reading instruction and student progress. In 2018, KPS was updated and has been used to review and give recognition to several university programs (IDA, 2022d). IDA also recognizes and accredits independent training programs that align with KPS, and those programs that also provide practicum experiences designated as accredited plus. Within KPS, content directly related to the NRP's five components of reading is included, along with knowledge of written expression, literacy acquisition foundations, assessment of reading difficulties, diverse reader profiles, and professional ethics. IMSLEC-accredited training programs are recognized under IDA accreditation plus programs, indicating the necessary knowledge and skill levels are provided by those training programs.

More recent studies have not only confirmed the need to strengthen preservice training programs and teachers' knowledge levels of reading instruction but also identified a lack of knowledge about dyslexia, which effects the largest group of students with disabilities served in public schools (Jordan & Bratsch-Hines, 2020; Mullikin et al., 2021; Phelps & Bridgeman, 2022). For instance, one study indicated special educators demonstrating the lowest level of knowledge about literacy and instruction, compared to general classroom educators, and reading interventionists (Porter et al., 2022). Preservice teachers majoring in special education improved their understanding and skills in literacy instruction to students with reading difficulties through not only well-designed course content but also practicum experience through the provision of after-school tutoring to at-risk students (Englert et al., 2020). Students receiving literacy instruction were assessed post-tutoring program and found to have significantly improved phonics skills. The combination of structured literacy instruction courses and field experience had a significant correlation to improved phonics abilities in students. Considering previous studies that demonstrated a lack of knowledge in structured literacy instruction and dyslexia, and with the reality of special education teachers having responsibilities in assisting with the largest population of special education students (SLD/dyslexia), the importance of knowledge levels and preparation is evident (Englert et al., 2020; Porter et al., 2022).

Studies have shown that early elementary-level teachers not only have some knowledge of dyslexia but also have gaps and are misinformed about some aspects of dyslexia (Mullikin et al., 2021; Ramli et al., 2019). Although teachers had higher levels of knowledge concerning the characteristics of dyslexia, they held poor information about how to identify or evaluate students in their classrooms. Findings also revealed the more years of teaching experience and the more informal training, the higher the level of knowledge. Informal training was defined as the individual teachers' initiative to read books and seek out training to help with their skills in

teaching students with dyslexia. Educators were seeking out the knowledge to improve instructional strategies. Other studies have supported the findings regarding dyslexia knowledge and skill levels of teachers, indicating the continued need for preservice training and ongoing support and professional development for teachers (Ramli et al., 2019; White et al., 2020; Yin et al., 2020). White et al. (2020) investigated the knowledge levels of pre-educators and noneducation majors regarding dyslexia and found no significant differences. The lowest scores were found in the area of teachers' perception of their ability to treat students with dyslexia, and they were also confused about what instructional components were appropriate to implement. The lack of knowledge and continued gaps and misinformation were seen as an interference with the proper identification and treatment. The potential to harm students by not identifying nor providing effective methods to help students with dyslexia is most concerning in that students may lose an opportunity to learn to read and reach their potential in post-secondary school.

Those individuals who provide reading instruction to students struggling to read may include general education classroom teachers, special education teachers, resource teachers, reading specialists, dyslexia interventionists, and academic language therapists, among others. The many different professionals working with students who have reading difficulties, with varying training experiences and levels of knowledge, exacerbate the confusion on who is to hold the responsibility for identification and treatment (White et al., 2020). Implications extend to the ability to provide an effective tiered support system of services to students with significant reading difficulties. Although ample investigations into the essential knowledge needed for reading instruction are available, the assessment of what type of training provides the most thorough knowledge of reading instruction still needs investigation. The investigation into the application of knowledge and skills would also be beneficial to the continued improvement of services to students with reading difficulties such as dyslexia. More recent studies have begun to demonstrate an

increase in knowledge by educators but lower levels of effective reading strategies, suggesting improvements are being made in how teachers are trained, but the continued need for application opportunities remains (Jordan & Bratsch-Hines, 2020; Phelps & Bridgeman, 2022).

MTSS/RTI

The primary focus of an MTSS is to provide an effective and efficient service delivery system, while RTI is an approach to MTSS focused on early screening and identification of at-risk students, primarily for reading difficulties. The most prevalent type of MTSS, RTI, incorporates three tiers of services, each progressively more focused and intense. Tier 1 and Tier 2 RTIs are usually provided by the general education classroom teacher, whereas Tier 1 is provided as differentiated classroom instruction, and Tier 2 is implemented through small group instruction for those students who were not responding to differentiated classroom instruction or were identified through assessment. Tier 3 intervention is most often provided by specially trained individuals and is optimally delivered in small groups outside the classroom. Research literature highlights the varied levels of success with MTSS/RTI implementation and student outcomes (Berkeley et al., 2020).

Studies have indicated and discussed the relevance of RTI in serving as a screening and identification tool (Hunter et al., 2022; Miciak & Fletcher, 2020; Nilvius & Svensson, 2021). The Individuals with Disabilities Education Improvement Act (2004) permits the use of RTI for the identification of students with specific learning disabilities, but Hunter et al. (2022) noted the lack of research as to the effectiveness of such a model. Others have stated proficient implementation of RTI provides a cogent system for the identification and intervention of students at risk for reading difficulties (Hunter et al., 2022; Miciak & Fletcher, 2020). Nilvius and Svensson (2021) found a closely monitored RTI framework along with early identification, frequent progress monitoring, and specialized, explicit intervention extending over 2.5 years resulted in much improvement in

reading skills. To evaluate the effectiveness of RTI, students identified in second and third grade were provided with dyslexia intervention and evaluated for responsiveness (Tilanus et al., 2020). Data indicated the second-grade students were initially far behind the third-grade students in most measures; however, after the implementation of an intervention, the second-grade students made more progress in the accuracy of decoding and were comparable to the third-grade students in other measures. The results supported the use of RTI for early identification, with an emphasis on the importance and effectiveness of early intervention. Berkeley et al. (2020) reported a decrease in special education referrals, possibly indicative of an effective RTI system. When implemented with fidelity and flexibility, research indicates that RTI as an effective framework for early identification, prevention, and intervention benefits students with reading difficulties (Berkeley et al., 2020; Hunter et al., 2022; Nilvius & Svensson, 2021). Continued training and monitoring are needed for the successful implementation of RTI, where students are screened, given Tier 1 or Tier 2 intervention, assessed, identified, and, if indicated, provided Tier 3 intervention to be administered by knowledgeable, trained, and supported interventionists. The lack of monitoring and support of RTI may either delay services to students with significant reading difficulties or misidentify students, leaving them without proper support.

Although there is much research concerning RTI implementation in elementary grades, the investigation of RTI framework use in middle and high schools is limited. Lesh et al. (2021), in a review of more than 300 administrators and other educators working in urban middle and high schools, found the implementation of MTSS/RTI confusing and often ill-conceived. Confusion over how RTI was to be implemented, who was to provide intervention, and what intervention should be used was noted. Results indicated administrators and special education teachers held higher beliefs in the effectiveness of RTI over general education teachers and other educational staff. Administrators and special education teachers also held higher beliefs in their skills to use

data to identify students in need of intervention and in their ability to apply RTI to instructional and intervention decisions. General education teachers not only believed they had a lack of skills to implement RTI but also communicated their desire to primarily focus on content-level instruction and thought it was not their position to provide RTI at the middle and high school levels. Lesh et al. (2021) suggested a high need for preservice teacher training for the implementation of RTI at the middle and high school level along with explicit reading strategies incorporated into university methods courses. The need for data-based decision-making skills and assessment technique familiarity was also recognized. Solis et al. (2022) found a more therapeutic model of intervention plausible for older students. At the high school level, reading comprehension was framed within the SVR's primary components of decoding and linguistic comprehension as causal for low reading comprehension skills. With consideration given to individual student evaluation measures, the recommendation to focus more on word meaning, vocabulary, and linguistic comprehension was recommended to improve reading comprehension, rather than a high focus on word-level skills (decoding) alone. Vaughn et al. (2020) examined the results of RTI responsiveness through word reading measures and found students with very low proficiency in word reading had minimal responsiveness to intervention over a given period, and students with minimally deficient word reading proficiency made significant gains through intervention. The authors suggest a continuum of reading difficulties, noting students exhibiting low levels of word reading skills on screening and assessment measures may require longer periods of intensive and specialized intervention before showing improvement. Intervention teams evaluating data for RTI implementation can predict responsiveness through word reading levels and prepare more effective measures to ensure that ample intervention methods, level of intensity, and duration are given to those students with scores in the lower spectrum of word reading skills. Although the majority of RTI may occur at the elementary level, effective upper school reading intervention has the potential to eradicate the

effects of poor or nonexistent intervention currently being reported. Middle and high school reading levels are significant barriers to students with reading difficulties. For upper school students to access the curriculum, reading for comprehension is crucial. Investment into materials, resources, and training for RTI is costly for schools, but the investment into intervention in the early years of education may not only prevent significant reading difficulties early on but may proactively diminish the cost of students failing later in their academic career (Nilvius & Svensson, 2021). School systems that approach intervention with a "wait-to-fail" strategy, open consequences to not only cost but of time and lost educational opportunity for students.

Difficulties with an RTI framework stem from the lack of knowledge concerning how RTI is to be implemented, who is to provide it, what evaluative and progress monitoring resources are to be used, and who is to provide the Tier 3 intervention. Not to mention, when RTI Tier 3 intervention is provided, how is fidelity and efficacy ensured, and how are those providing the intervention trained for such tasks? As with the knowledge of reading components and effective instructional strategies, research recognized preservice teachers' lack of preparedness in the implementation of RTI strategies to include student assessment, intervention, monitoring, and problem-solving and found professional development in coordinated efforts of school teams could mitigate knowledge gaps (Benedict et al., 2021; Hurlbut & Tunks, 2016).

Research reviewed by Arias-Gundin and Llamazares (2021) revealed great variations in methods for screening and identifying students at risk for reading difficulties. Although some schools used early education identification measures or demographics, some schools sampled entire school populations for early identification measures. The precarious nature of different implementation methods for screening lends itself to either over or under-identification. The review also indicated variations within the delivery of instruction and intervention, ranging from 90 minutes for most Tier 1 instruction to 20-30 minutes for Tier 2 and Tier 3 instruction. Personnel

implementing intervention ranged from classroom teachers to special education teachers, and delivery ranged from individual instruction to small group instruction. Tier 3 delivery of instruction was reported to have been implemented in as few as 20-minute sessions for 3 days a week, which is counter to recommendations by IDA (2022c) and ALTA (2022). Individuals providing Tier 3 intervention included general education teachers, special education staff, speech language pathologists, and other educational staff. Arias-Gundin and Llamazares (2021) found higher effect sizes when Tier 3 intervention was provided by educators rather than paraprofessionals, giving a possible indication of the needed knowledge for increased understanding and application of skills for Tier 3 intervention. Although the review indicated the positive use of the flexible RTI model, there was an emphasis on the need for specific RTI training for teachers. The difficulty in the review of research literature pertaining to MTSS and intervention for reading difficulties is in the variability of frequency and duration of intervention (Hall et al., 2021; Schlesinger & Gray, 2017). Individual studies and reviews indicated great variation in the length of services from 2 weeks to 2 years (Al Otaiba et al., 2022; Arias-Gundin & Llamazares, 2021; Field & Begeny, 2019; Partanen et al., 2019). Studies pertaining to RTI also noted differences not only in personnel but also in qualifications and preparedness of those providing services under RTI (Moats, 2017, 2020; Porter et al., 2022).

Tier 3 intensive intervention, which is provided to those students who have not responded to previous interventions or have been assessed and determined to have significant difficulties, is designed to focus on students' specified area(s) of weakness. Yet, research more often targets only specific components of reading instruction or examines programs that have rigidity in the implementation of the intervention (Benedict et al., 2021; Hall et al., 2021; Schlesinger & Gray, 2017). Although some intervention training programs focus on training individuals to implement a scripted program, a therapeutic model of intervention training program allows interventionists to

adjust instruction to student differences and needs (ALTA, 2022; Al Otaiba et al., 2022; IMSLEC, 2022; Miciak & Fletcher, 2020; Roberts et al., 2022). Absent from the research is an inspection of how different types of intervention training and knowledge and skill acquisition of interventionists may affect the efficacy of intervention. The research continues to demonstrate an overall lack of understanding and skill levels needed from educators to effectively teach reading, suggesting intervention implementation may also be affected by the knowledge levels of interventionists.

School administrators also play a significant role in the effectiveness of intervention services for struggling readers through their knowledge levels of reading and the differences in training options for dyslexia interventionists. School professionals, including school superintendents, reported a preference for NRP-supported materials but often purchased or implemented materials and programs that were not supported by NRP (Nelson et al., 2022). The school decision-makers who employ interventionists and send individuals for intervention training benefit from research that informs differences and preparedness levels for the provision of Tier 3 reading intervention. There are several avenues for training interventionists, and examination into the specifications, including what types of training programs elicit greater knowledge of structured literacy instruction, may assist with understanding influences on student outcomes and growth.

Dyslexia Intervention

As indicated in Chapter One, dyslexia is defined as neurobiological in origin and affects individuals' ability to learn reading skills. Dyslexia is reported to affect approximately 7% of the population worldwide using a strict band of confidence and larger exclusionary factors, while other reports indicate as much as 20% of students are dyslexic (Horowitz et al., 2017; Yang et al., 2022). Regardless, a significant amount of the population has significant difficulties learning to read. Concerning identification and treatment, the largest group of students served under special education are identified with an SLD most prominently in reading; many are also designated as

having dyslexia. With the passing of federal and state laws, there has also been an increase in early identification, intervention, and teacher training to remediate the high number of students with low reading abilities. The need for effective training of individuals who provide intervention to students with dyslexia increases with greater numbers of students identified with SLD/dyslexia.

Despite federal laws specifying the requirements of identification and eligibility of services for students with dyslexia, states have had much difficulty in being consistent concerning state laws and regulations pertaining to dyslexia (Gearin et al., 2022). The education of students with dyslexia in elementary, middle, and secondary school is guided by state legislation in 47 states (Gearin et al., 2022; National Center on Improving Literacy, 2019). Screening requirements and identification guidelines vary from state to state, possibly affecting the proper implementation of instruction and intervention. There are even a few states that do not recognize dyslexia, provide screening, or support dyslexia intervention. There are only eight states that support the components of universal screening, intervention, and in-service professional development requirements and communicate the need for preservice teacher training. Other states have variations of the specifications, and all states have variability within the definition and implementation of the components. Gearin et al. (2022) highlight the potential lack of identification of students with dyslexia in states with poor screening measures, and differences in state special education policies may negatively impact how students are supported. State protocols for identification may use the IQ-achievement discrepancy model, RTI system, establishment of a pattern of strengths and weaknesses, or a combination of the identification protocols. Recognizing differences in definition, screening, identification, and intervention, acknowledges the possible reasons for differences in the number of students identified and treated across states. There are also implications as to how researchers select participants that affect differences between studies. Using the IDA definition of dyslexia allows for continuity between researchers and educational institutions. There is more

work to be considered in the design and provision of screeners and identification measures. History has provided a good measure of research and prominent individuals contributing to the goal of accurately identifying and providing effective instruction and intervention to students with dyslexia.

The history of dyslexia includes reports and studies as early as the 1800s observing individuals with significant reading difficulties and has evolved into a better understanding of how people learn to read and the most effective methods to remediate individuals with dyslexia (Berlin, 1883). The understanding of how reading ability develops in young children, how the brain functions when learning to read, and specific strategies and methods necessary for remediation have all cumulated after decades of work and from the vantage points of many professions. The most prominent forerunners in the history of dyslexia include Samuel T. Orton, Jeanne Chall, Marilyn Jager Adams, Bennett and Sally Shaywitz, MaryAnn Wolf, and Stanislas Dehaene. There are many others, but the selected practitioners impart important information specific to identification and treatment pertinent to this study.

The speech-print connection needed for reading was recognized in early history with research by Samuel T. Orton (Orton, 1937). Although the word dyslexia was coined earlier by Rudolph Berlin (1883), Orton developed studies to understand brain functions for reading acquisition in dyslexics. Initially, he studied adults who had lost the ability to read from traumatic brain injuries but later began to focus on reading instruction for students with dyslexia. A pioneer in the etiology of reading difficulties and treatments, Orton partnered with Anna Gillingham, an educator and psychologist, to design and implement reading instruction and intervention based on methods that were systematic, flexible, therapeutic, and phonics-based. Their influence in advocating for the reading strategies needed to acquire successful reading continued with the development of the Orton Society, now called the IDA, along with the Orton-Gillingham

Academy, designed to train individuals in reading intervention. Orton-Gillingham (O-G) interventionists learn to provide systematic, explicit, and structured intervention therapeutically and train to become certified, requiring a minimum of 160 hours of coursework, 200 practicum hours, 10 observations, and other coursework requirements (Academy of Orton-Gillingham Practitioners and Educators, 2023). The requirements to become a certified O-G interventionist are similar to the requirements of IMSLEC and ALT certification programs. Many current curricula for dyslexia intervention are based on the O-G method and are recognized as a signature approach to dyslexia intervention (Sayeski et al., 2019).

Jeanne Chall, working in the field of reading, was a prominent individual in understanding how children learn to read and how to develop strong reading instruction (Chall, 1983, 1996). In the 1960s, Chall founded the Harvard Reading laboratory and served as a professor and researcher (Chall, 1996). She also authored books and consulted on several reading-oriented endeavors such as encyclopedias, a children's comic book, and the TV show *Sesame Street*. One of her pinnacle works was the development of reading stages, where each stage necessitates success in the previous stage (See Appendix B; Chall, 1983). The five stages of reading begin with Stage 0, where newborns to age 6 years begin to engage in understanding the concept of a book, experience being read to, and begin learning the concept of the alphabet. The last stage, Stage 5, usually occurs in individuals 18 years of age or older, where reading is for purpose, synthesizing previous knowledge with new information, and creating knowledge. Within the stages of reading, children with significant reading difficulties such as dyslexia are hindered from progressing through each stage and fall behind their peers. Chall, who initially worked with reading philosophies supporting whole language, investigated through the support of the Carnegie Corporation of New York what research indicated were the effective instructional strategies for reading (Chall, 1996). What resulted was the book *Learning to Read: The Great Debate*, where she discovered that the research

legitimated phonics-based instruction. Initially concerned about the practice of phonics and decoding hindering word meaning and comprehension skills, her review of the literature indicated students achieved higher results in reading comprehension when the initial emphasis on decoding was applied to early instruction. Although she was scrutinized by many of her peers who supported whole word and whole language instruction, Chall continued her work in reading research that applied the foundational understanding of reading as a phoneme-grapheme-based process. The identification of developmental stages of reading and the necessity of explicit instruction were some of her most prominent contributions to the field of reading instruction.

Marilyn Jager Adams supports SVR and Scarborough's reading rope with her emphasis on the necessity of both word-level reading and the combination of fluency and vocabulary development for the successful ability of reading comprehension (Adams, 1990). As a developmental psychologist, Adams's extensive review of research demonstrated the necessity of phonemic awareness to effective decoding skills and the connections with the linguistic application of semantics in developing reading skills. In the field of reading instruction and intervention, she provided research-based support for practices that align with the SVR and application of Scarborough's reading rope for effective practices. Her research stressed the concept of the English language being based on the alphabetic principle and necessitating a phoneme-grapheme connection to beginning reading abilities.

Bennett Shaywitz, a neurologist and neuroscientist, and Sally Shaywitz, a physician, co-founded and co-directed the Yale Center for Dyslexia and Creativity in Connecticut. Their partnership includes their passion for understanding dyslexia and providing resources to help parents, teachers, and students. Shaywitz's book, *Overcoming Dyslexia* (2003), provides an approachable text for parents and scholars alike to understand how the brain processes language and what strategies are effective in remediating dyslexia (Shaywitz & Shaywitz, 2005). Shaywitz

and Shaywitz have written hundreds of research studies, all in their mission of helping to assist the large percentage of individuals with dyslexia, which they noted as 20% of the world's population. Current research they have been involved with includes the investigation of illiteracy in prison populations, confirming high rates of prisoners with dyslexia (Cassidy et al., 2021). The First Step Act (FSA; First Step Act, Pub. L. No. 115-391, 2018) requires prisons to screen and provide programs for prisoners found to have dyslexia. The FSA law includes the provision for identification and treatment of dyslexia, allowing prisoners with dyslexia who participate in an intervention to earn credits for time incarcerated reduction. Of further importance is the FSA's definition of dyslexia that states dyslexia is unexpected and in the presence of intelligence levels indicative of higher reading levels, along with deficits in phonological processing. Other research in which Sally Shaywitz participated includes a longitudinal study, following students from kindergarten through ninth grade, investigating verbal expression and reading comprehension (Holahan et al., 2018). The study noted the importance of strong conversational and activity-based intervention, beginning at an early age and continuing throughout school, which is implemented in a structured, systematic manner and uses evidence-based instruction in phonological awareness, word-level reading, fluency, and comprehension in efforts to close the gap between students with significant reading difficulties and their peers. Within their research studies is the importance of structured, systematic, direct, and explicit intervention for students with dyslexia. Shaywitz and Shaywitz support the need for instruction to be implemented 4-5 days a week for as much as 90 minutes a day over a 1-to-3-year period and provided by knowledgeable interventionists who can apply individualized intervention in a flexible and prescriptive manner. Their continued work assists teachers and others in understanding and developing resources that not only support struggling readers but also advocate for effective reading instructional strategies.

MaryAnn Wolf is currently the Director of the Center for Dyslexia, Diverse Learners, and Social Justice at the University of California, Los Angeles. She has written several books, two of which are titled *Proust and Squid: The Story and Science of the Reading Brain* (Wolf, 2008), and *Reader, Come Home: The Reading Brain in a Digital World* (Wolf, 2019). Her books, along with her research, further strengthen the understanding of how the brain has learned to read and what are some concerning implications of digital reading. Important to dyslexia intervention is the support of foundational concepts concerning dyslexia and how the brain processes sound to print and print to sound to produce functional reading abilities. Wolf has also written or co-written reading instruction materials and an assessment tool useful for the early identification of students who struggle with reading. She continues to serve through research and speaking engagements to communicate the process involved in the amazing ability to read and how to best assist those who struggle.

Stanislas Dehaene is a cognitive neuroscientist from France who has written extensively on how the brain functions and specifically on how the brain learns to read. In his book, *Reading in the Brain: The New Science of How We Read*, Dehaene (2010) walks through the neurological process involved in print-to-speech activities and how individuals with dyslexia struggle because of difficulties in the language processing areas of the brain. With the use of such technologies as fMRI and electro-encephalography, Dehane comprehensibly, yet with clarity, explains the ability of the dyslexic brain to be remediated through intensive intervention, allowing the brain to reformulate and rechart language processing. Within his research, he explains the implausibility of whole-word reading and how the importance of brain research informs effective reading strategies. The necessity of explicit instruction and the use of synthetic phonics as opposed to other forms of phonics, such as analogy and analytic, is emphasized. Synthetic phonics is a bottom-up, part-to-whole view that necessitates the grapheme-phoneme connection as critical to the foundational

skills needed for learning to read. Dehaene (2010) supports SVR and its connection of both decoding and linguistic comprehension in the development of reading comprehension.

From the research of prominent leaders addressed prior, consistent support occurs for the important knowledge of reading as a learned skill, the brain's ability to process and learn to read, the difference in the brain of individuals with dyslexia, the important aspects of effective reading instruction, and the necessity for trained individuals in providing explicit, structured, systematic, and flexible intervention. Within an MTSS model, RTI Tier 3 dyslexia intervention supports students with significant reading difficulties including dyslexia. The application of research from forerunners implies the need to ensure proper assessment, early identification, quality training of both teachers and interventionists, and continued support to ensure that effective intervention is provided with fidelity. Students with dyslexia are on a continuum of reading skill levels that are at the lower spectrum of the total population of readers and require significant and specific types of intervention strategies (Galuschka et al., 2020; Sleeman et al., 2022). Given the large variability in current interventionist training, research into what types of training provide the most knowledgeable participants is a valid concern. Studies have indicated differences in training coursework and practicum requirements, variations in schools' scheduling of length and duration of intervention sessions, and differences in amounts of multisensory strategies implemented (Hall et al., 2021; Schlesinger & Gray, 2017). A review of research investigating intervention strategies helps to clarify what are effective components and strategies and how interventionists play a significant role in effective intervention. How and who provides Tier 3 dyslexia intervention, and to what extent interventionists know and understand structured literacy instruction intervention, is an area that implicates interventionist training.

Effective intervention can be founded on the supporting theoretical frameworks of SVR and Scarborough's reading rope. The SVR states the necessity of decoding along with linguistic

comprehension in acquiring reading comprehension abilities (Gough & Tunmer, 1986). Scarborough's reading rope separates the components into subsets, allowing researchers to more definitively identify reading strategies that affect reading progress in students with dyslexia (Scarborough, 2001). Some studies have considered the importance of intervention strategies that combine and connect components to increase skills (Austin et al., 2022; van Rijthoven et al., 2021). Word reading and word meaning skills were connected to assess the effects on accuracy, fluency, and comprehension in students with dyslexia (Austin et al., 2022). Findings indicated significant improvements in upper elementary students' reading skills when word meaning was combined with word reading. The explicit instruction and use of academic language not only allowed students to increase basic reading skills but also increased vocabulary and comprehension skills needed for core content areas. Students with dyslexia, especially those who are older, encounter higher levels of academic vocabulary, and a combined skills intervention strategy led to not only greater word reading accuracy but increased fluency and comprehension skills.

A review of the literature revealed dyslexia interventions that focused on phoneme-grapheme connections were not enough to significantly increase reading and spelling skills, and improvement was increased when morphology and semantics interventions were incorporated (Galuschka et al., 2020; van Rijthoven et al., 2021). Connecting components of language in intervention yielded positive effects on overall reading skills (van Rijthoven et al., 2021). Within the discussion and conclusion of the studies, the importance of well-planned and explicit, direct instruction emphasized the need for individualizing dyslexia intervention. The ability for interventionists to individualize and focus intervention strategies to meet students' needs allows for increased use of connecting varying reading components specific to students' grade levels, resulting in increased basic skills, fluency, and comprehension. Other studies investigated intervention beginning early, or implemented in later elementary grades, with the findings

demonstrating the earlier a student with dyslexia receives training, the greater the increase in skills

acquisition (Tilanus et al., 2020). While students in third grade made improvements, it was not at

the same level of progress as those who began in second grade, and the most significant growth in

second-grade students was in the areas of word and pseudoword decoding and spelling skills. The

study's authors stated the importance of tailored and targeted intervention. In a review of post-

treatment reading development, students who participated in a 1-year intervention focused on word

and pseudoword reading and fluency continued to struggle 1 year after completion of the

intervention (van der Kleij et al., 2017). The recommendation to continue monitoring and

potentially provide further intervention was given by van der Kleij et al. (2017). The limitations to

a preset timeline for intervention start and stop appear to impact those students with dyslexia who

may be at the lower level of the continuum suggesting the need for continued support for

individualized and flexible dyslexia intervention models.

Dyslexia therapy provided by certified individuals consists of direct, explicit, multisensory,

and systematic instruction (IDA, 2022c). Therapy-level certification requires over 200 hours of

training, 700 hours of teaching hours, and 10 demonstrations (ALTA, 2022; IDA, 2022c, 2022d).

Dyslexia therapy is to be provided to students 3-5 days a week, for approximately 45 minutes, and

uses a direct, systematic, prescriptive, and multisensory approach to dyslexia intervention.

Dyslexia intervention, under RTI, is a Tier 3 service for students who are either assessed for

services or who have not responded to Tier 1 and Tier 2 services. Students who receive Tier 3

dyslexia therapy usually require 2 to 3 years of intervention to acquire the reading skills needed for

adequate reading comprehension skills. McMahan (2019) addressed differences in the training of

dyslexia interventionists and recommended further studies. Studies that are well-designed and

focused on the implementation of structured literacy instruction are needed. Although much

research has been completed in many areas of reading instruction, dyslexia, teacher training, and

instructional methods, there is a lack of research on the efficacy of therapeutic models of dyslexia intervention. There is also a lack of information and research on what types of intervention training provided participants with high levels of knowledge in structured literacy instruction. Most school districts provide dyslexia intervention but vary in means, materials, and teacher training (Texas Education Agency, 2018). The study of dyslexia intervention training programs and structured literacy knowledge levels of program participants is needed.

Summary

Research has evidenced low reading scores from a large percentage of students, highlighting the continued need to examine literacy instruction. Specific attention to the 20% of school-aged students with significant reading difficulties identified as dyslexia has implications for national reading levels and society, as literacy affects individuals' abilities to communicate and participate in higher employment opportunities. Investigation into preservice training, curricula, and teacher efficacy indicate disparities, inaccuracies, and exclusion of research-based materials and strategies. Classroom intervention has been found to have inadequacies in effectively providing quality instruction or improving student reading skills. The literature review confirms the lack of fidelity and effectiveness of many preservice teacher training programs as well as the lack of knowledge and skills in both preservice teacher training instructors and in-service teachers. Tier 3, dyslexia intervention has not produced a quantity of research to inform effectiveness or knowledge levels of dyslexia intervention training participants from differing types of programs. A lack of research examining Tier 3 level intervention program differences and effectiveness in training knowledgeable dyslexia interventionists supports further study. Students with significant reading difficulties require intervention that is explicit, systematic, and intensive, focusing on the components of reading that lead to reading comprehension. The components of reading as outlined by the NRP and other research findings support the need for intervention focusing on the hierarchal

skills of each component beginning in early grades to improve reading skills effectively. There have been many historical figures who have provided foundational understandings of dyslexia and effective intervention. Current researchers continue to investigate and examine reading components and reading strategies that inform training and instruction. Having the knowledge of structured language and developing the skills needed to provide intervention in a prescriptive manner and with fidelity requires training and practicum opportunities. To increase the potential of improving students' reading scores that are below proficiency level, investigation into dyslexia intervention training and the potential for increased structured language knowledge has implications for future development of training content and methods.

CHAPTER THREE: METHODS

Overview

The purpose of this quantitative, causal-comparison study was to investigate differences between the independent variable, types of dyslexia intervention training, with the dependent variable of structured literacy knowledge of participants. The chapter begins with the design introduction, including definitions and variables, followed by the research question and null hypothesis. A description of the participants and setting, instrumentation, and procedures will be given to clarify data collection procedures. Finally, the identification of the statistical procedure used and its appropriateness will be explained.

Design

The purpose of this quantitative causal-comparative study was to investigate the difference in structured literacy knowledge between participants from different types of dyslexia intervention training programs: therapy level, teacher or practitioner level, and other types of programs. A quantitative causal-comparative study was selected based on the structure of the study and the data analysis capabilities. The study incorporates one dependent variable, structured literacy knowledge, and three independent variables, dyslexia intervention training program types. In addition, the rationale for the selection of a quantitative causal-comparative study design was its usability within education with ease of translation. The primary reasons for selecting the causal-comparative design are the educational field's familiarity with forming groups for categorizing differences and the ease of data analysis comprehension and interpretation, as indicated by Gall et al. (2007). Gall et al. (2007) also suggest a causal-comparative design provides an economical way to conduct an investigative study in determining the potential for future experimental research design studies. The naturally occurring nonmanipulated groups form the independent variable for the causal-comparative design study. The independent variable categories of dyslexia intervention

training program types include the therapy level, teacher or practitioner level, and other types of training programs with fewer completion requirements. The study will provide an analysis of the differences in structured literacy knowledge between the independent variable of types of dyslexia intervention training programs.

To examine differences in educators' knowledge of particular topics, such as dyslexia, dyslexia intervention, and literacy instruction, several studies have used the causal-comparative design to determine differences between variables and to report results clearly and concisely (McMahan et al., 2019; White et al., 2020). Van der Kleij et al. (2017) applied a causal-comparative research design in comparing progress between two groups of students receiving reading intervention and reporting analysis and discussion of results with implications to current educational practices. One of the important design structures is to precisely define, select, and assign individuals to the comparison groups, which Gall et al. (2007) stated as a precursor to alleviating potential manipulation of data and providing meaningful interpretation. Using data from an online assessment measurement, an exploratory data analysis for descriptive statistics of each comparison group occurred, followed by an analysis determining significance. The results of a causal-comparison research study provide data to support or negate the pursuit of the more thorough but expensive and involved, experimental research design.

By selecting groups of participants from either therapy level intervention training program, teacher or practitioner level training program type, or other types of intervention training programs, the calculated means were used for interpretation, although limited in causation interpretation. Examining the dependent variable, structured literacy instruction knowledge, the scores from differing dyslexia intervention training program types, using a causal comparison design, can provide the clarity and conciseness needed to understand the quality of dyslexia intervention training. The comparison of dyslexia intervention training types and participants' knowledge of

structured literacy instruction also offers potential data for understanding and developing dyslexia intervention training programs. For exploratory investigation, a causal-comparative design using nonexperimental groups was appropriate, giving initial information and evidence needed for future research, as discussed by Gall et al. (2007). Limitations to the study include small sample sizes and understanding the limits to participants from mostly southern states hindering the generalization to the U.S. population of dyslexia training centers and interventionists.

Research Question

RQ1: Is there a difference in structured literacy knowledge between dyslexia interventionists with therapy-level training, teacher- or practitioner-level training, or other types of dyslexia interventionist training?

Hypothesis

The null hypothesis for this study is:

H_0**1:** There is no difference in structured literacy knowledge as measured by the Basic English Language Knowledge (BELK) test between dyslexia interventionists with therapy-level training, teacher- or practitioner-level training, or other types of dyslexia interventionist training.

Participants and Setting

The participant and setting section will first address population descriptors followed by population specifications, sampling technique, and the size of the samples. A study's ability to generalize results to the larger, target population depends upon how the sample was derived and the sample size (Gall et al., 2007). Establishing precise definitions for the framework and selection procedures for comparison groups affects the interpretability of the study and also distinguishes the causal-comparison research design from experimental research designs. Lastly, the setting is discussed, introducing the dyslexia intervention training program types, differences between program types and requirements, and how participants accessed the assessment measure.

Population

A convenience sample was chosen from dyslexia interventionist training center participants across the United States but primarily in the southern states. Training centers in Texas and Mississippi generated the majority of participants. Although an original goal of 150 participants was not acquired from the initial seven selected training centers, social media solicitation allowed for further acquisition of participants from several other states. The search led to a total of 124 participants from 14 states. Training program representation included therapy-level and teacher- or practitioner-level programs recognized by IMSLEC. Other types of training programs included school district-designed programs and state-approved programs, all of which did not meet the standards of therapy or teacher- or practitioner-level type programs. Therapy and teacher- or practitioner-level programs included those leading to certification through ALTA, IDA, or the Academy of Orton-Gillingham Practitioners and Educators. All names of individuals and facilities were assigned alphabetical and numerical representations to ensure anonymity.

Participants

The initial goal of three even groups of participants was not acquired. The therapy-level group included 49 participants, the teacher- or practitioner-level group had 22 participants, and the other group had 23 participants. All 94 participants were female, and a total of 17 different types of certifications were reported by participants including 27 with reading specialist certification, 20 holding special education certification, and 38 with Certified Academic Language Therapy certification. Other types of certifications included Certified Academic Language Practitioner ($f =$ 7), National Institute for Learning Disabilities certification ($f = 1$), Certified Structured Literacy Dyslexia Specialist ($f = 5$), Licensed Dyslexia Therapy ($f = 18$), Licensed Dyslexia Practitioner ($f = 4$), Master Teacher ($f = 1$), Orton Gillingham Certification ($f = 2$), Principal Certification ($f = 1$), Educational Diagnostician Licensure ($f = 1$) and English as a Second Language certification ($f = 1$).

Sixty-nine of the participants held a master's degree.

Setting

The setting included dyslexia intervention training centers located in several states, primarily from southern states. Program training centers for therapy and teacher- or practitioner-level were recognized by either ALTA, IDA, or IMSLEC, indicating their compliance with the standards established for the training types. Training programs varied in length of training time, practicum hours, and other requirements, such as practicum observations. Those programs leading to therapy-level intervention required 200 hours of instruction, 700 hours of practicum, 10 formal observations, and other requirements, such as book reports and conference attendance (ALTA, 2022; IDA, 2022c; IMSLEC, 2022). The training programs for teacher- or practitioner-level required participants to acquire 45 hours of instruction, 60 practicum hours, and five observations. Other programs varied in requirements, but all fell below the ALTA, IDA, and IMSLEC standards.

<p style="text-align:center">**Instrumentation**</p>

Basic English Language Knowledge Test

The purpose of the knowledge test was to measure participants' understanding of the key components of reading instruction. The knowledge assessment used a 50-question format designed by McMahan (2019), adapted from previous literacy knowledge surveys (Binks-Cantrell et al., 2012; McMahan et al., 2019; Moats, 1994). See Appendix C for the permission to use the BELK test. The BELK test was an appropriate instrument, as the design was initially used for those providing literacy intervention and had been implemented in research measurements of those providing intervention-level services (McMahan, 2019; McMahan et al., 2019). The BELK test included Form A and Form B, covering essential components of the English language, including phonemic sensitivity, phonemic awareness, decoding, encoding, and morphology (McMahan, 2019). For the purposes of this study, only Form A was implemented. The Cronbach's alpha of

Form A was .86 and of Form B was .87, as noted by McMahan (2019).

The scoring criteria for the BELK test followed the specifications provided by McMahan (2019). The total score derived from the accumulation of one point per correct question answered gave a possible maximum score of 50. The possible total score ranges from 0, meaning the participant had no basic understanding of structured literacy knowledge, to 50, indicating the participant had an excellent understanding of structured literacy knowledge. Means from total scores achieved were used for analysis. The BELK test could take approximately 30 minutes to complete and was accessed by the participants from either an email solicitation forwarded by the training facilities or from a social media graphic with a link. After completion of the BELK test by the participants, results were collected on Google Forms for analysis to be used by the researcher. Permission to use the assessment and administration directions were given (see Appendix C and Appendix D).

Procedures

After IRB permission was granted from Liberty University, dyslexia intervention training facilities were contacted with a request to distribute a solicitation email to graduates who had completed training within the last 5 years (see Appendix E). Training facilities then used their contact information lists and sent emails to potential participants. Each email included information about the study, consent information, assurance of anonymity, and a link to the survey (see Appendix F). The assessment measure was transferred in its entirety to a Google Form, along with the request for descriptor information, such as gender, training completion date, state of residence, acquired certifications, and education level. Training program participants who volunteered for the study signed an electronic consent form and completed the assessment using a link attached to an email or made available through a social media graphic. Volunteer participants who completed the BELK test on the Google Form were instantly available for review and analysis by the researcher.

Google Forms allowed for data collection and organization and the data were then transferred to the statistics software, IBM SPSS Statistics, for analysis completion. At all stages of the data collection, all information that could identify the participants was protected. Data were stored securely, and only the researcher had access to records. Data were stored on a password-protected external drive or a secure online platform. While not in use, the external drive was stored in a locked cabinet. Data will be retained for 5 years after the research study is completed.

Data Analysis

Considering the statistical analysis explained by Gall et al. (2007), a one-way ANOVA was used to address RQ1 for the quantitative causal-comparative study. The rationale included the existence of one dependent variable, three independent variables, and the question of whether there was a statistically significant variance between the independent variables. In addition, the dependent variable, the scores on the testing instrument, had a score with an absolute value of 0 that was preferred for the use of an ANOVA. The one-way ANOVA assessed whether there was any significance between groups, although it did not reveal which groups had significant differences between them. When completing the one-way ANOVA, there were a few steps to be taken before addressing the assumptions, as indicated by Gall et al. (2007). A visual observation check assessed whether any completed tests had missing answers or other abnormalities in the data that would have disqualified the participant's results from being used in the data analysis. The first assumptions test was a box plot to identify possible outliers within any of the three groups that could construe results. The next step was to address the assumption of normality by using the Shapiro-Wilk test to determine whether there was a normal distribution within each of the groups. The Shapiro-Wilk test was chosen because of its power and appropriateness for the sample size, while the Kolmogorov-Smirnov test would have been a consideration with a larger sample size. Then, the homogeneity of variance Levene's test was used to determine if the independent variable

populations in each group were the same. The assumptions tests revealed whether an ANOVA

could be run or if one or more of the assumptions indicated an ANOVA was not appropriate to use.

Once the one-way ANOVA was completed and a statistical significance between groups was found

($p < 05$), a post-hoc Tukey test identified where the statistical significance between groups

occurred. The Tukey test employed a significance level of $\alpha = .05$ for rejection of the null

hypothesis. Partial eta squared determined effect size, indicating how much of a significance the

independent variable had on the dependent variable (Warner, 2021).

CHAPTER FOUR: FINDINGS

Overview

Training for dyslexia intervention, as with other educator training, instills foundational knowledge for implementation and application within the instructional environment. Structured literacy knowledge provides dyslexia interventionists with the key information necessary for instruction and may impact the effectiveness of the intervention. The problem is that there are great variations in training requirements for dyslexia intervention, including training hours, practicum hours, and other types of requirements; however, there is little understanding as to the amount of structured literacy knowledge accrued from varying types of training programs. Chapter Four purposes to provide descriptive statistics from differing dyslexia interventionist training levels and comparisons to structure literacy knowledge. After a presentation of descriptive statistics, a discussion of results in relation to the research question and hypothesis is given.

Research Question

RQ1: Is there a difference in structured literacy knowledge between dyslexia interventionists with therapy-level training, teacher- or practitioner-level training, or other types of dyslexia interventionist training?

Null Hypothesis

H_01: There is no difference in structured literacy knowledge as measured by the BELK test between dyslexia interventionists with therapy-level training, teacher- or practitioner-level training, or other types of dyslexia interventionist training.

Descriptive Statistics

For each of the three groups, statistics were obtained on the dependent variable of structured literacy knowledge. Descriptive statistics are reported in Table 1.

Table 1

Descriptive Statistics

Group	*n*	*M*	*SD*
Therapy level	49	42.02	3.332
Teacher or practitioner level	22	38.59	4.113
Other	23	37.52	5.656
Total	94	40.12	4.609

Results

Hypothesis

There is no difference in structured literacy instruction knowledge as measured by the BELK test between dyslexia interventionists with therapy-level training, teacher- or practitioner-level training, or other types of dyslexia interventionist training.

Data Screening

Data screening was conducted on each group's dependent variable. The data were scanned for entry errors and inconsistencies by the researcher. No data errors or inconsistencies were identified. To detect outliers in the dependent variable, a box and whiskers plot was used. Upon inspection of the boxplot, no significant outliers were identified. See Figure 1 for the box and whisker plot.

Figure 1

Box and Whisker Plots (Dependent)
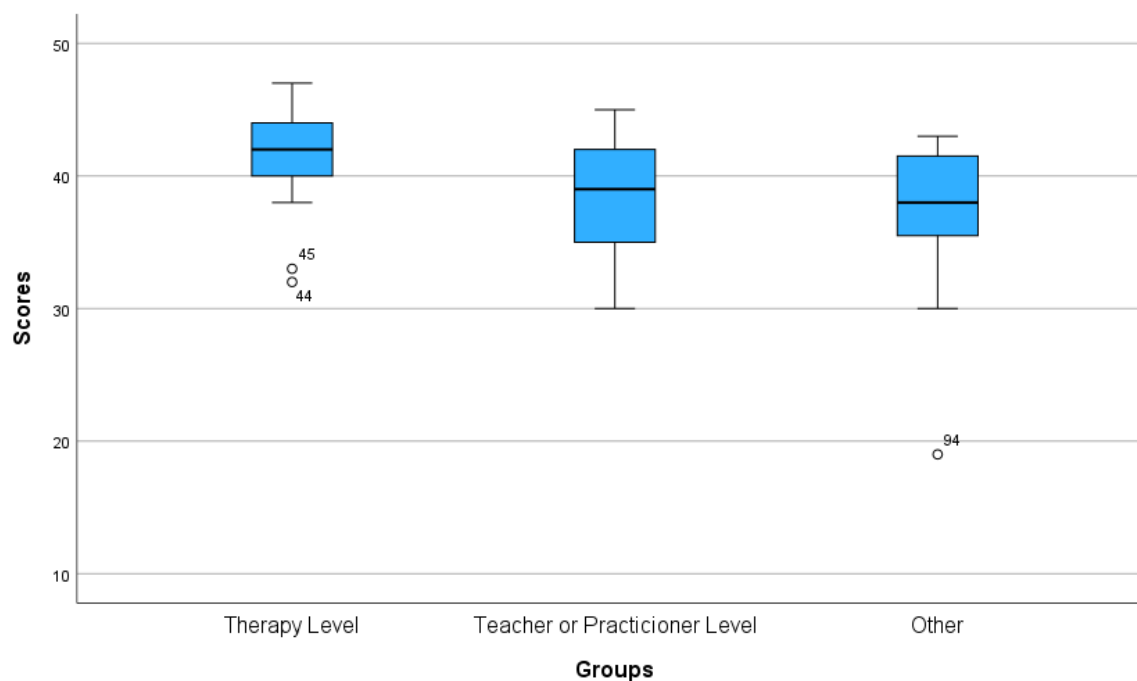
Assumptions

To test the null hypothesis, an ANOVA was used. The ANOVA required that the

assumptions of normality and the homogeneity of variance were met. The Shapiro-Wilk test was

used to examine normality because the sample size was small (less than 50). The Shapiro-Wilk

assumption of normality test indicated the teacher- or practitioner-level group met the assumption

of normality while the therapy and other level groups did not meet the assumptions of normality,

suggesting a nonnormal distribution. The concern for not meeting the assumption of normality is

the potential for making a Type I error, which would be to reject the null hypothesis when it is true.

Considering small and unequal group sample sizes, the decision was made to continue with the

one-way ANOVA as it is a robust test with less concern for Type I errors. Refer to Table 2 for the

tests of normality.

Table 2

Tests of Normality

	Groups	Shapiro-Wilk		
		Statistic	*df*	Significance
Scores	Therapy	.940	49	.015
	Teacher/Practitioner	.954	22	.385
	Other	.831	23	.001

Assumption of Homogeneity of Variance

Levene's test was used to examine the assumption of homogeneity of variance. No violation was found where $p = .084$. The assumption of homogeneity of variance was met.

Results for the Null Hypothesis

The one-way ANOVA was performed to investigate differences in structured literacy knowledge between different levels of dyslexia intervention training groups. The researcher rejected the null hypothesis at 95% confidence, where $F(2, 91) = 10.96$, $p < .001$, $\eta_p^2 = .194$, with a very large effect size (Warner, 2021). Because the null hypothesis was rejected, a Tukey post hoc test analysis was conducted to compare all possible pairs of means. The results indicated the therapy group ($n = 49$, $M = 42.02$, $SD = 3.33$) had significantly higher structured literacy knowledge survey scores than both the teacher- or practitioner-level group ($n = 22$, $M = 38.59$, $SD = 4.11$) and the other level group ($n = 23$, $M = 37.52$, $SD = 5.66$). See Table 3 for multiple comparisons of groups.

Table 3

Multiple Pairwise Comparisons of Groups

(I) Groups	(J) Groups	Mean difference (I-J)	*SE*	*p*	95% Confidence interval Lower bound	Upper bound
1	2	3.429*	1.073	.005	.87	5.99
	3	4.499*	1.057	<.001	1.98	7.02
2	1	−3.429*	1.073	.005	−5.99	−.87
	3	1.069	1.247	.669	−1.90	4.04
3	1	−4.499*	1.057	<.001	−7.02	−1.98
	2	−1.069	1.247	.669	−4.04	1.90

Note. Results of Tukey HSD; dependent variable = training types.
Group 1 = Therapy; Group 2 = Teacher / Practitioner; Group 3 = Other

*The mean difference is significant at *p* < .05 level.

CHAPTER FIVE: CONCLUSIONS

Overview

Structured literacy knowledge is foundational for educators who teach reading, particularly for those who provide intensive intervention to students with dyslexia. Understanding the level of structured literacy knowledge of dyslexia interventionists begins with the awareness of the variability within dyslexia intervention training program requirements. This study proposed to investigate three different types of dyslexia intervention training programs and participants' knowledge of structured literacy. A discussion of the findings from the quantitative causal-comparative study and implications will be presented, followed by the limitations and recommendations proposed for future research.

Discussion

The purpose of the quantitative causal-comparative study was to investigate structured literacy knowledge of dyslexia interventionists from three different types of training programs. The three types of dyslexia intervention training programs included therapy-level programs requiring 200 hours of coursework, 700 hours of practicum, 10 observations and other types of coursework requirements, teacher- or practitioner-level programs requiring 40 coursework hours, 400 practicum hours, five observations, and potentially other types of assignments, and other types of dyslexia interventionist training programs requiring fewer than the aforementioned programs. Previous research has examined the structured literacy knowledge of general education teachers, special education teachers, and administrators, but there remains a lack of research that considers potential variances in knowledge levels of dyslexia interventionists with different training backgrounds (McMahan, 2019; McMahan et al., 2019). The importance of structured literacy knowledge holds relevancies for all positions of individuals who instruct reading.

According to Gough and Tunmer (1986), the SVR framework provided a formula ($D \times C =$

R) of decoding (D) combined with linguistic comprehension (C) in the development of the product of reading (R) The SVR framework hinges on the need for both decoding and linguistic comprehension, together, in the formulation of successful reading. Although the formula appears simplistic, the understanding of what constitutes decoding instruction and the many subcomponents of linguistic comprehension form the key to a deeper appreciation of SVR. Scarborough (2001) further delineated the SVR components with subcomponents, which intertwined towards reading comprehension development, illustrating the complex nature of reading (see Appendix A). Scarborough's reading rope visualized an understanding of phonemic awareness, decoding, and sight word recognition as designated subcomponents of word recognition. Likewise, background knowledge, vocabulary, language structures, and verbal reasoning function as subcomponents of language comprehension. Both SVR and Scarborough's reading rope indicated a required understanding and application of each component and subcomponent for successful reading.

The structured literacy knowledge test used in the current study contained questions from the components and subcomponents of reading that aligned with both SVR and Scarborough's reading rope (McMahan, 2019). McMahan discussed the purposeful design of the structured literacy knowledge test, which included five domain areas: phonemic sensitivity, phonemic awareness, decoding, encoding, and morphology. Questions included those addressing both knowledge and skill level in a multiple-choice format. Results from the study help to confirm the need for quality training, which provides the high level of structured literacy knowledge needed for dyslexia intervention. The amount of coursework and practicum hours required for the therapy-level training allows for greater exposure to the depth and scope of structured literacy knowledge compared to teacher- or practitioner-level training or other types of training. The mean score of the therapy-level training program participants was 42.02, while the mean scores for the teacher- or

practitioner-level training and other types of dyslexia intervention training programs were 38.59

and 37.52, respectively. Successful dyslexia intervention begins with the ability to understand and

apply structured literacy knowledge and skills. The statistically significant difference between

scores from the therapy-level group compared to the two other groups suggests that the therapy-

level training programs provide the development of knowledge and skills needed for successful

dyslexia intervention.

Students across the nation continue to score below proficiency levels in reading despite

actions at the federal and state levels to improve (NAEP, 2020; NRP, 2000; No Child Left Behind

Act of 2001, 2002). Measures to identify students at risk early and provide intervention led to the

incorporation of the MTSS within many school districts. RTI, a three-tiered system of services, has

been used in schools with Tier 1 and Tier 2 designed to identify students at risk and provide

intervention by the general education classroom teacher. Yet, research reveals the lack of

continuity within MTSS and RTI implementation and concerns regarding the preparation of

educators in the provision of intervention needed for student success (Berkeley et al., 2020; Lesh et

al., 2021; Peston et al., 2016). For Tier 3 intervention, students are provided services by a trained

individual, often referred to as a dyslexia interventionist. The current study focused on those

individuals who provide the intense intervention required of Tier 3.

McMahan (2019) and McMahan et al. (2019) found that individuals who participated in

training programs at the therapy level acquired higher scores than individuals with no training,

which is supported by findings from the current study. Many of the individuals who completed the

BELK test in the current study reported training in multiple programs and from varying levels of

training. Those individuals who participated in a training program at the therapy level scored

higher on the structured literacy knowledge test than participants in either of the two other groups.

The findings align with previous research findings. Therapy-level training participants have higher

knowledge of reading components that are essential for the instruction of students with reading difficulties (McMahan et al., 2019).

School districts across the United States employ individuals for dyslexia intervention to serve students with dyslexia and fulfill federal and state regulations. However, there is little guiding information for decisions about where to send individuals for training, or employment decisions concerning differences in knowledge and skill level acquisition. States, such as Texas, publish well-devised dyslexia handbooks, which provides administrators and others with a list of training programs and some information concerning certification levels, but no information about knowledge levels or preparedness obtained (Texas Education Association, 2018). According to the Texas Dyslexia Handbook, dyslexia instruction must include simultaneous, systematic, cumulative, explicit, diagnostic, synthetic, and analytic instruction and must include instruction in all components of reading. Effective training programs are pertinent to the acquisition of skills and knowledge needed for such instruction. Individuals who provide dyslexia intervention may be reading specialists, hold master's degrees, or be certified in special education, as confirmed by the current study, but may still lack knowledge in structured literacy (McMahan et al., 2019; Porter et al., 2022).

Individuals who pursue training as a dyslexia interventionist have many options with a great degree of variance in the length of training, requirements for completion, and cost. Although the training program providers may choose to achieve accreditation through the IMSLEC, and some may establish standards that meet the needs for individual certification through such entities as the ALTA or the IDA, research-based studies that investigate the participants' knowledge levels are lacking (McMahan, 2019). The current study specified training levels, forming three differing groups, and required participants to have completed training within the last 5 years, limiting the experience factor. There were 25 intervention programs represented in the study, varying from

IMSLEC-accredited programs that could lead to ALTA or IDA certification, to nonaccredited programs that did not lead to outside certification. Several participants were trained in more than one program and at different levels. The highest level of training was used for placement into groups.

Results from the current study not only clarify the effectiveness of different types of dyslexia intervention training but more importantly indicate the significant differences found in structured literacy knowledge between participants in different types of programs. Participants from the therapy-level type of dyslexia intervention training program obtained significantly higher scores on the BELK test than participants from the two other types of training programs. The contents of the structured literacy test consisted of questions specific to the foundational components of reading, and the therapy-level participants reported a higher understanding of the necessary information needed for successful dyslexia intervention. When discussing the preparedness of individuals for reading instruction, one of the primary goals of any training is for participants to acquire high levels of knowledge that impact instructional skills needed to increase student success. In addition to the structured literacy knowledge scores, the current study revealed the large number of training programs available. Twenty-five different programs were reported by participants, with most individuals having participated in more than one type of training.

It was interesting to note that individuals who participated in programs categorized in the other level group often participated in therapy-level training later. Individuals may have begun their training in programs with fewer requirements but later completed therapy-level programs with many more required hours of instruction, practicum, and observations. Also recorded was a large number of individuals at all group levels with a master's degree and other certifications such as reading specialist or special education. Representation of such a large number of training programs from 14 states also suggests discrepancies across the United States regarding how dyslexia

intervention is approached. Understanding that there are major differences amidst dyslexia intervention training programs and significant differences in structured literacy knowledge between types is a further step in improving reading scores across the United States, especially for those students with dyslexia with whom regular reading programs are not sufficient.

Implications

National reports continue to indicate low reading scores for students across the United States (NAEP, 2020). The largest group of students served under special education are students with a learning disability in reading. The NAEP reported students with disabilities scored significantly lower than the national average in reading. Research indicated that 85 % of students who have gone through the juvenile court system were functionally illiterate (Begin to Read, 2022). Federal and state laws have been enacted to address the low reading scores nationwide (No Child Left Behind Act of 2001, 2002). Many school systems have incorporated an MTSS to help identify and provide intervention early to address the high number of students with low reading scores. The Tier 3 intervention services for students with significant reading difficulties require specifically trained individuals who incorporate structured literacy knowledge into the intervention.

Across the United States, a plethora of training programs are available for selection and have a wide range of variances in length of training, practicum requirements, cost, and observation hours. Studies have indicated low levels of structured literacy knowledge by general education teachers, special education teachers, and administrators, yet little is known about the knowledge levels of reading and dyslexia interventionists. Some research is available that discusses preservice training and preparedness for reading instruction, and some research has been completed investigating professional development training. Other research has focused on specific components of reading, but little is known about the training of dyslexia interventionists and

structured literacy knowledge (Al Otaiba et al., 2022; Englert et al., 2020; McMahan et al., 2019; Partanen et al., 2019; Stevens et al., 2021). Knowing how to best prepare individuals to provide effective Tier 3 intervention has implications for preparedness levels, quality of intervention, and student success.

In this study, those individuals who completed therapy-level dyslexia intervention training programs within the last 5 years scored significantly higher in structured literacy knowledge than participants from other types of programs. Therapy-level training requires a higher number of hours of coursework, practicum, and observation, and has other requirements to support intense, mentored, intervention training. Students who receive Tier 3 training usually meet a minimum of 3 days of week for at least 45 minutes each session. Tier 3 training is also continued through a 2-to-3-year program for each student. What is being taught, how it is being taught, and the success levels often hinge on the effectiveness and knowledge level of the interventionists. Therefore, an understanding of the types of dyslexia intervention training that provide higher levels of structured literacy knowledge helps to advise decision-makers on the best way to help students with reading disabilities and dyslexia develop higher reading skills. The importance of the study is the information pertinent to structured literacy knowledge of individuals completing different types of dyslexia intervention training programs and impacting future research in best practices for dyslexia intervention training and intervention to students with a learning disability in reading or dyslexia.

Dyslexia intervention is provided by individuals who have obtained specialized training to serve in the position. The number of options for training is large, and who decides where, when, and with whom is a decision that may have a huge impact on student success. Without an understanding of what types of training may provide higher levels of knowledge and skills, the selection may be diminished to such variables as location, length of training, and financial differences. The aim of any intervention is to improve students' abilities. The selection of

educators who are qualified to obtain higher levels of student success includes consideration of individuals who have acquired higher levels of knowledge and skills to carry out such interventions. The understanding of what types of programs provide the highest quality of knowledge and skills is information that can assist with how to invest resources, especially in relation to student progress expectations in reading. Structured literacy knowledge is the foundation to intervention success and the current study indicates there are significant differences between differing types of training. The investment into therapy-level training, as indicated by the current study, imparts higher levels of structured literacy knowledge. The result from the current study gives encouraging information for decision-makers investing in student reading progress and may be helpful for future program developments.

Limitations

Although the study provides a better understanding of dyslexia intervention training and structured literacy knowledge, several limitations must be considered. Demographic information was self-reported, although means were taken to solicit from reputable resources. Email contact limited participation due to changes in email addresses and firewalls limiting access. The initial goal of 150 participants was not met despite much effort and an extended length of time. Difficulties with the acquisition of a large and equal number of group participants, along with maintaining contact with participants for the completion of forms, were obstacles to the study.

When completing the data analysis, the Shapiro-Wilk test of normality was met for the teacher- or practitioner-level group, but the therapy and the other level group violated the test of normality. Small participant numbers may have had an impact on assumption testing; however, ANOVA is robust for Type I error and the decision was made to continue with the analysis. Having larger group numbers, particularly with an even distribution across groups, may have allowed a more clarified interpretation of the one-way ANOVA. Subsequent post-hoc Tukey tests

did confirm a statistical difference in structured literacy knowledge between groups, but consideration must be given within the interpretation of the assumptions testing results.

Recommendations for Future Research

Recommendations for further research include:

1. Larger sample sizes would assist with assumption testing limitations.

2. The addition of a fourth group of educators with no dyslexia intervention training would give a greater perspective to the statistical analysis and results.

3. Pre- and post-dyslexia training assessment to facilitate measurement of prior knowledge and growth of structured literacy knowledge would give data specific to training effectiveness.

4. A longitudinal study with the addition of student monitoring from varying group levels of dyslexia intervention would further inform effective dyslexia intervention training types.

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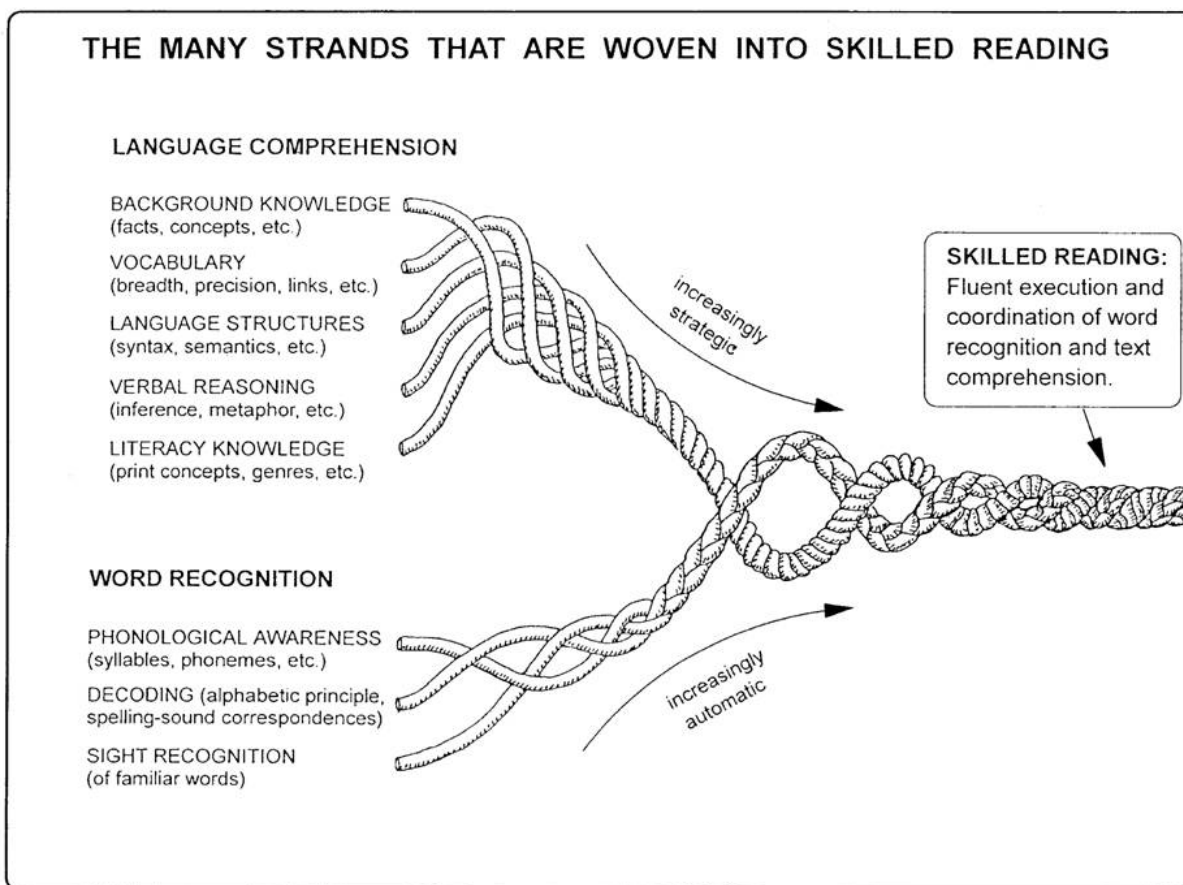
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APPENDIX A

Scarborough Reading Rope

THE MANY STRANDS THAT ARE WOVEN INTO SKILLED READING

LANGUAGE COMPREHENSION

BACKGROUND KNOWLEDGE
(facts, concepts, etc.)

VOCABULARY
(breadth, precision, links, etc.)

LANGUAGE STRUCTURES
(syntax, semantics, etc.)

VERBAL REASONING
(inference, metaphor, etc.)

LITERACY KNOWLEDGE
(print concepts, genres, etc.)

increasingly strategic

SKILLED READING:
Fluent execution and coordination of word recognition and text comprehension.

WORD RECOGNITION

PHONOLOGICAL AWARENESS
(syllables, phonemes, etc.)

DECODING (alphabetic principle, spelling-sound correspondences)

SIGHT RECOGNITION
(of familiar words)

increasingly automatic

APPENDIX B

Chall's Stages of Reading Development

Chall's Stages of Reading Development
Source: Jeanne S. Chall, *Stages of Reading Development*. N.Y.: McGraw--Hill Book Company, 1983.

Stage	Approximate Age/Grade	Characteristics and Masteries by End of Stage	How Acquired	Relationship of Reading to Listening
Stage 0: Pre–reading "pseudo reading"	6 months – 6 years Preschool	Child "pretends" to read, retells story when looking at pages of book previously read to him/her, names letters of alphabet; recognizes some signs; prints own name; plays with books, pencils and paper.	Being read to by an adult (or older child) who responds to and warmly appreciates the child's interest in books and reading; being provided with books, paper, pencils, blocks, and letters. Dialogic reading.	Most can understand the children's picture books and stories read to them. They understand thousands of words they hear by age 6 but can read few if any of them.
Stage 1: Initial reading and decoding	6 – 7 years old 1st grade and beginning 2nd	Child learns relation between letters and sounds and between printed and spoken words; child is able to read simple text containing high frequency words and phonically regular words; uses skill and insight to "sound out" new one syllable words.	Direct instruction in letter–sound relations (phonics) and practice in their use. Reading of simple stories using words with phonic elements taught and words of high frequency. Being read to on a level above what a child can read independently to develop more advanced language patterns, vocabulary and concepts.	The level of difficulty of language read by the child is much below the language understood when heard. At the end of Stage 1, most children can understand up to 4000 or more words when heard but can read about 600.
Stage 2: Confirmation and fluency	7 – 8 years old 2nd and 3rd grade	Child reads simple, familiar stories and selections with increasing fluency. This is done by consolidating the basic decoding elements, sight vocabulary, and meaning context in the reading of familiar stories and selections.	Direct instruction in advanced decoding skills; wide reading (instruction and independent levels) of familiar, interesting materials that help promote fluent reading. Being read to at levels above their own independent reading level to develop language, vocabulary and concepts.	At the end of Stage 2, about 3000 words can be read and understood and about 9000 are known when heard. Listening is still more effective than reading.
Stage 3: Reading for learning the new Phase A Phase B	9 --- 13 years old 4th – 8th grade Intermediate 4th – 6th Junior high school 7th – 9th	Reading is used to learn new ideas, to gain new knowledge, to experience new feelings, to learn new attitudes, generally from one viewpoint.	Reading and study of textbooks, reference works, trade books, newspapers, and magazines that contain new ideas and values, unfamiliar vocabulary and syntax; systematic study of words and reacting to the text through discussion, answering questions, writing, etc. Reading of increasingly more complex text.	At beginning of Stage 3, listening comprehension of the same material is still more effective than reading comprehension. By the end of Stage 3, reading and listening are about equal for those who read very well, reading may be more efficient.
Stage 4: Multiple viewpoints	15 – 17 years old 10th – 12th grade	Reading widely from a broad range of complex materials, both expository and narrative, with a variety of viewpoints.	Wide reading and study of the physical, biological and social sciences and the humanities, high quality and popular literature, newspapers, and magazines; systematic study of words and word parts.	Reading comprehension is better than listening comprehension of materials of difficult content and readability. For poor readers listening comprehension may be equal to reading comprehension.
Stage 5: Construction and reconstruction	18+ years old College and beyond	Reading is used for one's own needs and purposes (professional and personal); reading serves to integrate one's knowledge with that of others, to synthesize it and to create new knowledge. It is rapid and efficient.	Wide reading of ever more difficult materials, reading beyond one's immediate needs; writing of papers, tests, essays, and other forms that call for integration of varied knowledge and points of view.	Reading is more efficient than listening.

APPENDIX C

Permission to Use Survey Instrument

Fri 2/4/2022 10:34 AM

To:

- Alm, Rhonda;
- ████████████████████████
- Hi Rhonda,

Attached are copies of the survey with the answer key, and administration and scoring directions. I'm also sending you our other recent publication that used this measure as well as ██████████ dissertation where she presented some more information about its psychometric properties. As ████ email below indicates, you have permission to use this survey in your research.

Best of luck with your dissertation and please reach out to us if you have additional questions.

Regards,

████

████████████████████████████████
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APPENDIX D

Administration Directions

Removed to comply with copyright.

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APPENDIX E

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

May 30, 2023

Rhonda Alm
Susan Stanley

Re: IRB Exemption - IRB-FY22-23-1152 Quantitative Causal-Comparative Study of Structured Literacy Knowledge Between Participants of Dyslexia Intervention Training Programs

Dear Rhonda Alm, Susan Stanley,

The Liberty University Institutional Review Board (IRB) has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study to be exempt from further IRB review. This means you may begin your research with the data safeguarding methods mentioned in your approved application, and no further IRB oversight is required.

Your study falls under the following exemption category, which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46:104(d):

Category 2.(iii). Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) if at least one of the following criteria is met:
The information obtained is recorded by the investigator in such a manner that the identity of the human subjects can readily be ascertained, directly or through identifiers linked to the subjects, and an IRB conducts a limited IRB review to make the determination required by §46.111(a)(7).

Your stamped consent form(s) and final versions of your study documents can be found under the Attachments tab within the Submission Details section of your study on Cayuse IRB. Your stamped consent form(s) should be copied and used to gain the consent of your research participants. If you plan to provide your consent information electronically, the contents of the attached consent document(s) should be made available without alteration.

Please note that this exemption only applies to your current research application, and any modifications to your protocol must be reported to the Liberty University IRB for verification of continued exemption status. You may report these changes by completing a modification submission through your Cayuse IRB account.

If you have any questions about this exemption or need assistance in determining whether possible modifications to your protocol would change your exemption status, please email us at irb@liberty.edu.

Sincerely,
G. Michele Baker, PhD, CIP
Administrative Chair
Research Ethics Office

APPENDIX F

Research Participant Consent Form

QUANTITATIVE CAUSAL-COMPARATIVE STUDY OF STRUCTURED LITERACY

KNOWLEDGE BETWEEN PARTICIPANTS OF DYSLEXIA INTERVENTION

TRAINING PROGRAMS

Rhonda Alm

Liberty University

School of Education

You are invited to be in a research study of dyslexia interventionist knowledge of structured literacy. You were selected as a possible participant because you have completed a dyslexia intervention training program within the last five years. Please read this form and ask any questions you may have before agreeing to participate in the study.

Rhonda Alm, a doctoral candidate in the School of Education at Liberty University, is conducting this study.

Background Information: The purpose of the study is to determine, using a quantitative causal-comparative design, if there is a difference in knowledge of structured literacy between different types of dyslexia intervention training programs.

Procedures: If you agree to be in this study, you are asked to complete the following:
1. Demographic pre-test
2. Basic English Language Knowledge (BELK) test via the Google link.

Risks: There are minimal risks involved in the study, which means they are equal to risks encountered in everyday life.

Benefits: Direct benefit from study participation should not be expected.

Compensation: A $25.00 Amazon gift card will be given to four random participants who complete the pre-test and the BELK test and choose to be a part of the drawing.

Confidentiality: The records of this study will be kept private. In any sort of report, I might publish, I will not include any information that will make it possible to identify a subject. Research records will be stored securely, and only the researcher will have access to the records.

To protect participants:
- Participants will be assigned a group and individual number.
- Data will be stored on a password locked computer or separate hard drive which will be lock up when not in use and may be used in future presentations.

After five years, all electronic records will be deleted.

Voluntary Nature of the Study: Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University. If you decide to participate, you are free to withdraw at any time without affecting those relationships.

How to Withdraw from the Study: If you choose to withdraw from the study, please exit the test and close your internet browser. Your responses will not be recorded or included in the study.

Contacts and Questions: The researcher conducting this study is Rhonda Alm. You may ask any questions you have now. If you have questions later, you are encouraged to contact her at ████████████ You may also contact the researcher's faculty chair, (Dr. Susan Stanley), at ████████████.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, you are encouraged to contact the Institutional Review Board, 1970 University Blvd., Green Hall Ste. 2845, Lynchburg, VA 24515 or email at irb@liberty.edu

Disclaimer: *The Institutional Review Board (IRB) is tasked with ensuring that human subjects research will be conducted in an ethical manner as defined and required by federal regulations. The topics covered and viewpoints expressed or alluded to by student and faculty researchers are those of the researchers and do not necessarily reflect the official policies or positions of Liberty University.*

Consent: Before agreeing to be part of the research, please be sure that you understand what the study is about. You can print a copy of the document for your records. If you have any questions about the study later, you can contact the researcher using the information provided above.