USING CONSTANT TIME DELAY TO TEACH THE RECOGNITION OF FUNCTIONAL SIGHT WORDS TO TRANSITION-AGE STUDENTS WITH SIGNIFICANT INTELLECTUAL DISABILITIES

by

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ABSTRACT

For the purpose of this research, a concurrent multiple baseline design was used to measure the effects of a Constant Time Delay (CTD) intervention. CTD was implemented as an intervention to support four transition students' abilities to recognize functional sight words. The sessions were held during a summer transition program on a large university campus where students were housed in an inclusive dorm setting. Participants received the CTD intervention for the purpose of learning functional sight words. The students received the CTD intervention individually in a room designed for tutoring or study groups located in the dorms. Findings suggested that CTD was effective as evidenced by the number of sight words for 3 out of 4 participants who not only learned to recognize the ten target words but were able to generalize the words across probes and settings and maintain the words at three and six-week maintenance sessions. Results, implications, and future research are also discussed.

DEDICATION

I dedicate this dissertation to my parents, Wiley and Edwina Price. Without them, I would never have had the courage to pursue nor complete the doctoral program. They are the most selfless people I know and have given and continue to give to others especially their children and grandchildren. They have continually given me hope and the courage to believe in myself no matter what the circumstances. My completion of this program is a testament to their commitment as parents.

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CHAPTER I:

INTRODUCTION

All students regardless of culture or cognitive ability have the right to live in a democratic society where they can participate to the fullest extent possible. All students deserve to be provided with evidence-based research strategies that will allow them access to their community and the world in which they live (Licari, 2015). Supporting a student's ability to read is a critical beginning point for practitioners, researchers, and policy makers. It is argued that the ability to read is the most important academic skill needed for students to have success in school as well as having the opportunities to participate productively in society (Mule, Volpe, Fefer, Leslie, & Luiselli, 2015; Musti-Rao, Lo, & Plati, 2015). In addition, students who do not learn to read have less opportunity and suffer economically as well as in quality of life (Browder, Wakeman, Spooner, Ahlgrim-Delzell, & Algozzine, 2006).

Students with significant intellectual disabilities are often not provided the educational opportunities that their peers without disabilities are afforded. Students with disabilities, especially significant intellectual disabilities, are many times isolated and are not permitted access to meaningful learning opportunities, simply because educators are not aware of their hidden potential. Teacher self-efficacy to educate marginalized students and student self-determination both impact a student's success. Teachers must believe they have access to appropriate instructional strategies that allow them to teach individual students effectively as well as possess high expectations for their students who learn differently and many times at a slower pace (Ruppar, Gaffney, & Dymond, 2014). Equally as important is student self-

determination, the belief they have power over their own lives to make intentional choices about what is meaningful and valuable for their lives (Erickson, Noonan, Zheng, & Brussow, 2015).

Addressing these and other needs of students with significant intellectual disabilities requires that researchers and practitioners understand the lived experiences of the individual lives that their research will impact. Therefore, specifically chosen interventions must have an evidence-base that testifies to its effectiveness for particular student characteristics. In other words, an intervention must have proven educational validity that supports and enhances relevant skills for students with significant disabilities (Browder, Ahlgrim-Denzell, Spooner, Mims, & Baker, 2009).

To determine an effective intervention that will offer students with significant disabilities opportunities to engage in academic and social activities, educators must keep in mind the "big picture" of appropriate goals for the individual. For literacy outcomes, a conceptual framework should be employed to build understanding of how a particular process fits into the larger picture for the student's future. A conceptual framework regarding literacy instruction for students with significant disabilities should be one that provides positive outcomes. This literacy framework involves a complex and integrated process comprised of reading components including language, comprehension, memory, motivation, and knowledge (Allor & Chard, 2011). Successful reading instruction includes both lower level processes (phonemic awareness, letter-sound associations, blending skills and word recognition) as well as higher level skills (oral language, fluency, and comprehension). At both the lower and higher processing levels, automatic word identification is necessary for students to obtain literacy outcomes. For students with disabilities, this process is not effortless; however, research indicates that students can learn with appropriate supports (Allor & Chard, 2011; Allor, Mathes, Roberts, Cheatham, & Champlin, 2010). Students with

significant disabilities have limited cognitive and memory skills and require tasks that do not overload their cognitive capacity. Therefore, the challenge for educators and researchers is to determine appropriate interventions for particular students with specific characteristics that enable them to develop lower level functional literacy skills from which they can build upon (Coleman, Cherry, Moore, Park, & Cihak, 2015).

Students with significant intellectual disabilities need support in remembering, attending, eliminating distractions, and developing appropriate social responses (Coleman et al., 2015). Consequently, determining appropriate interventions for developing students' functional literacy skills involves defining the component features and theoretical underpinnings of the intended intervention. For students with significant disabilities, there is support for time delay procedures to teach functional skills that will allow them access to community resources and a foundation to build greater literacy skills based on their future goals (Allor & Chard, 2011; Browder et al., 2009).

In the past, students with significant intellectual disabilities received limited instruction in reading (Browder FULL, 2006). Rather much of their instruction focused mainly on functional daily living skills (Browder et al., 2006). Consequently, lack of attention to reading instruction results in only one in five students with significant intellectual disabilities learning to read even with minimal skills (Allor, Mathes, Roberts et al., 2010). Students with significant intellectual disabilities need instruction in functional academics to achieve these foundational skills, but instruction cannot stop at this stage. Educators must believe and expect that students with disabilities can and will learn to read, and must be prepared to allow students more time and more intensive instruction (Browder et al., 2006). Students with mild to significant intellectual disabilities can make progress in reading when provided with evidence-based instructional

interventions that are explicit, systematic, and comprehensive. In some cases, these interventions must be provided over more than one academic year (Allor, Mathes, Roberts, Cheatham, & Otaiba, 2014). Therefore, educators must not assume that a student will not be able to read because of the severity of his/her disability and must assume the responsibility for determining the most effective interventions to attain positive reading outcomes for each student (Browder et al., 2006).

As researchers and practitioners recognize the undiscovered potential in students with significant intellectual disabilities, they also realize that there has been a lack of attention to instructional strategies as well as a lack of academic progress evidenced for this population. This lack of progress has resulted in legal mandates as in the No Child Left Behind Act (NCLB) of 2001 and the Individuals with Disabilities Education Act (IDEA) of 2004 increasing pressure on educators to seek and implement effective and appropriate practices for reading instruction that will create greater opportunities for success with students with disabilities (Cook, Tankersley, & Landrum, 2009). Students with disabilities are to have access to the general education curriculum (IDEA) as well as high-quality instruction and evidence based practices (Spector, 2011). Furthermore, all students are expected to meet Common Core State Standards (CCSS) making it imperative for educators to find interventions that help students with significant disabilities achieve these goals (Constable, Grossi, Moniz, & Ryan, 2013).

In addition to the fore mentioned legislation, it should be noted that reading in general has received much attention at the policy level creating initiatives that affect what is being taught in the classroom. IDEA mandates that all students are to take part in state assessments; however, if students are not able to participate, they must have access to alternate assessments along with accommodations provided on an individual basis. NCLB has increased pressure on states for

high stakes accountability highlighting the need for increased reading performance, in general and specifically on standardized tests. Furthermore, NCLB mandates that schools make adequate yearly progress (AYP) in reading, math, and science. This progress is to be evidenced by all students including those with disabilities. Subsequently, NCLB stipulates that only 1% or less students with significant intellectual disabilities may receive alternate or extended standards assessments. These assessments must be aligned with the state curriculum standards and must encourage the highest achievement of the standards (Browder et al., 2006). Consequently, states are responding by mandating textbooks, aligning them to pacing guides, and increasing progress monitoring probes. Two federal initiatives specifically created for producing reading outcomes include the Reading Excellent Act (proposing to improve reading outcomes with the use of evidence-based strategies) and Reading First (competitive state grant tied to improving reading achievement for students from low-income areas).

These initiatives have increased federal and state involvement in educational policy calling for appropriate instructional practices. High stakes accountability became part of the Reading First policy and part of NCLB with the intent to address needs and support schools serving students from low socioeconomic areas who needed to improve reading scores. To receive funds associated with this grant, states had to demonstrate that they were implementing scientifically-based curricular and instructional practices. The National Reading Panel (NRP, 2000) is a congressional mandate to determine research-based teaching practices and interventions for teaching reading. The panel identified five areas essential to the reading process, and Reading First drew on these areas as well including phonemic awareness, phonics, fluency, vocabulary, and comprehension (Browder et al., 2006; Kamil, Pearson, Moje, & Afflerbach, 2011).

Moreover, Reading First called for diagnosis and prevention of reading difficulties. This included valid assessments, interventions, and monitoring of students with difficulties. More specifically, both the Reading Excellent Act and Reading First attached funds to the use instructional methods that were determined to be evidence-based as well as professional development sessions ensuring the proper use of these methods and interventions (Kamil et al., 2011).

As perceptions change for teaching students with significant intellectual disabilities, researchers and practitioners realize the need for interventions and procedures that possess the essential components inherent in student learning characteristics including memory, attention, appropriate behavior, attending, and skill transference (stimulus control, learning is transferred from teacher to the student) (Allor et al., 2014; Coleman et al., 2015). In addition, students with autism who may also be diagnosed with significant disabilities have similar characteristics but also need support with verbal and nonverbal communication as well as with stereotyped behaviors that interfere with their attention to learning (Walker, 2008). Inherent in time delay interventions are components that address these specific characteristics. Time delay interventions are response prompting procedures that have been found as evidence-based practices for teaching students with significant disabilities. In addition, research supports using time delay in groups as well as one-on-one settings, for individuals with mild disabilities as well as with significant disabilities, and in community-based learning settings (Browder et al., 2009). Other studies suggested that time delay strategies can be effective with a range of students with varying ages and exceptionalities, effective across different trainers, and have been found to be methodologically sound (Walker, 2008). Most importantly, time delay can be used to teach the

skills that are most important to students with significant intellectual disabilities (Browder et al., 2009).

The evidence-base for teaching students with significant intellectual disabilities using time-delay was predicated by Horner, Carr, Halle, McGee, Odom, and Wollery's (2005) standards for determining evidence-based practices by applying quality standards for single-subject research. These standards will be discussed more fully in the literature review of this dissertation. Based on these standards, time delay procedures were found to be especially evidence-based for students with intellectual disabilities (Browder et al., 2009; Horner et al., 2005). Critically, time delay has a theoretical foundation in that it has evolved from behavior analysis, and this foundation supports the linking of research and theory providing validation for practices used in the classroom for students with specific characteristics. Time delay allows for the students to begin to practice stimulus control with less and less teacher support, and the concept of stimulus control is based in behavior analysis (Browder et al., 2009)

Time delay specifically for functional and academic sight word recognition involves a discrete and observable response where the student will say or point to the word. This response is contingent on the printed stimulus or the printed word. Once the stimulus is delivered, the student has an opportunity to respond. Reinforcement is delivered with response for this particular stimulus and not another stimulus (being the particular word), allowing for a discriminative stimulus to be taught. If the student does not provide the response for the target stimulus (printed word), the teacher may provide an additional or second stimulus, a verbal model (saying the word when presenting the target word). This is referred to as a prompt. The immediate presentation of the prompt reduces chances for errors. This reduction in error allows time delay procedures to produce near errorless performance for students (Browder et al., 2009;

Walker et al., 2008). For the student to obtain stimulus control, the control must be transferred from the second stimulus, verbal word prompt, to the target stimulus of saying the word. This is an especially important skill for the student who has difficulty with skill transference. Students with significant intellectual disabilities need to acquire transference of particular skills for independence and literacy, allowing them more opportunities to make their own choices as well as have greater community access and a better quality of life (Allor et al., 2014; Coleman, 2015).

For students with significant intellectual disabilities to acquire transference, they may need a 0-second time delay between the presentation of the stimulus and the prompt meaning that when the word is presented, the prompt (verbal model) is also delivered. Touchette (1971) found that including a short time delay (1 second, 2 seconds,….5 seconds) between the target stimulus and the prompt of saying the word allowed students time to anticipate the correct response. Touchette (1971) recommended beginning initial trials between stimulus and prompt with 0-second delays and increasing the delay by 0.5 second, allowing stimulus control to be transferred from the prompt to the target with few to no errors (Browder et al., 2009; Touchette, 1971; Walker, 2008).

There are a variety of time delay or response prompting procedures including system of least prompts (SLP, requiring more support), most-to-least prompts (MLP, requiring less support), and fading prompts. Simultaneous prompting (SP), progressive time delay (PTD) and constant time delay (CTD) have been found to be highly effective for teaching students with significant intellectual disabilities and students with autism. Simultaneous prompting involves presenting an instructional cue (discriminative stimulus of the written word) and at the same time as presenting the controlling prompt (teacher saying the target word) with student responding

immediately (Browder et al., 2009; Coleman et al., 2015; Walker, 2008). Progressive time delay allows for a graduated delay, and constant time delay allows for a standard delay.

CTD has been suggested to be more manageable than PTD especially with lower functioning students and more efficient than SLP in some studies (Walker, 2008). Research has demonstrated that both delay procedures have been found to be efficient and structured to allow significant control over the environment and a student's interactions within the environment (Walker, 2008). In addition, the procedures increased positive interactions for students, were easy to implement and efficient, and can be generalized to other environments. As research supports the use of all three procedures with students with significant disabilities, the determining factor in deciding which procedure to use should be based on individual student's characteristics and support needs. As Touchette pointed out when discussing this issue of transfer of stimulus and selecting the appropriate procedure for a particular individual: "They bear out Skinner's (1966) contention that 'no two organisms embark on an experiment in exactly the same condition nor are they affected in the same way by the contingencies in an experimental space'" (as cited in Touchette, 1971, p. 353). For this reason, researchers should painstakingly identify and report their participant characteristics as this information provides essential knowledge to the study and impacts evidence for research-based practices available for practitioners.

Reading Research in Special Education

Understanding the evolution of research paradigms is essential to determining where we are and where we need to go in reference to teaching students with significant intellectual disabilities. Ensuring that educators have adequate resources to draw upon to provide appropriate interventions is important for improving the research to practice gap. Additionally, research must

be readily available so educators can determine which interventions are most appropriate for students. The following provides a brief overview of knowledge progressions in reference to teaching students with disabilities.

Epistemology

Scholarly journals, many times, operate from a specific epistemological stance (what is counted as knowledge), accepting only certain forms of research for publication and dissemination while dismissing other scholarship forms simply because of conflicting epistemologies (Danforth, 2006). However, what is important especially for the special education field is providing research for policy makers, educational leaders, and practitioners that help create educational environments that are inclusive and supportive of all persons without adhering to a specific epistemology. Danforth (2006) argued that, in regard to research, the field does not need to cling to one specific way of knowing. Researchers should instead determine to create educational communities designed to include all, communities where lines of difference and disability do not separate but seek to form a more democratic society for all where all are educated together (Danforth, 2006).

These arguments are not new and date back to great thinkers including Plato, Pierce, Dewey, and James who also sought to agree on a specific theory of knowledge but found no solid consensus. Therefore, the search of a particular epistemology for what counts as knowledge appears needless for improving quality of life. Danforth quoted Rorty:

> Our identification with our community—our society, our political tradition, our intellectual heritage—is heightened when we see this community as ours rather than *Nature's, shaped* rather than *found*…In the end what matters is our loyalty to other human beings clinging together against the dark, not our hope of getting things right. (Rorty, 1982, p. 166)

Disability Research

Seeking one right way of knowing for the field of special education is unnecessary. There is no one right way to educate every student. Researchers must not only seek to answer questions of what intervention or practice will work but also what works, when does it work, with whom does it work, and how does it work (Danforth, 2006; Klingner & Boardman, 2011). Research must be seen as a culturally-situated practice where student diversity is addressed. Culture contributes greatly to who students are and how they learn. Researchers must seek to understand culture when planning, designing, and implementing interventions. Researchers who espouse a post-positivist epistemology believe that research and resulting practices are acultural and negate the importance of students' lived experiences (Danforth, 2006; Klingner & Boardman, 2011).

A juxtaposition of stances, lenses, and paradigms is needed for addressing lived experiences and diversity of students. Pragmatism is a paradigm that does not adhere to one research method but instead seeks varying ways for inquiring into what may work for a particular student or a small group of students. Pragmatism seeks to find what works in real context specific situations but does not necessarily espouse a specific epistemology. Researchers who align with a pragmatic paradigm know that one size does not fit all and selects methods for particular purposes that answer set questions (Savin-Baden & Major, 2013).

Single-Subject Research/Evidence-Based Practices

Practitioners in the field of special education require access to evidence-based practices for students with varying disability characteristics for academic and behavioral outcomes. However, there is scarce evidence to meet these needs; hence, teachers are obliged to use the information available to them (Horner et al., 2005). The Council for Exceptional Children's Interdivision Research Group suggested that teachers use characteristics of evidence-based

practices to judge the quality of interventions before implementing them with specific populations. Evidence-based interventions are mandated and place emphasis on research evidence, high quality, replication, and population representation (Council for Exceptional Children, 2014). Although, there is no one intervention that will work with all students all the time, practitioners must seek to provide interventions that have proven success with specific populations.

Single-subject research is especially well-suited for special education as this method can address concerns at the individual level seeking to determine causal or even functional relationships between variables. In addition, single-subject allows for within and between group comparisons situated in complex situated environments (Horner et al., 2005). Furthermore, single-subject designs comprise features that provide quality indicators that can be used to determine if an intervention is evidence-based. Specifically, for special education, single-subject can provide accurate analysis of effects taking into account intervention introduction and manipulation. Single-subject is especially useful in understanding the outcomes for a particular individual under certain conditions. Answering these types of questions is the central focus for special education research (Horner et al., 2005).

Intervention Research

Research on reading interventions must focus on intervention kind, intensity, duration, population, and context to determine what interventions produce the greatest outcomes for which students. Students with significant disabilities need explicit and direct instruction to help them make gains in reading performance (Musti-Rao et al., 2015). For students, with limited working memory and executive functioning, appropriate interventions are critical as brain developments closely align with reading progress. Understanding the significance of brain development and its

association with reading acquisition is central for reading researchers and practitioners. Intensive interventions may help students acquire reading specific executive functioning skills and manage the multiple features of language that may allow them to better manipulate reading processes (Cartwright, 2012).

Word reading fluency is considered essentially the most influential stumbling block for developing reading skills (Fletcher, Lyon, Fuchs, & Barnes, 2007). Context in which the words are learned may increase or decrease student learning due to instructional task demand. Neuroscientific studies have even shown that brain activation of students with reading disabilities have exhibited closer to normal functioning after students receive intensive interventions (Simos, Flectcher, Bergman, Breier, Foorman, & Castillo et al., 2002). Once students can recognize words automatically without conscious effort, cognitive resources are allowed to be utilized for higher order reading skills, such as comprehension. Therefore, the ability to recognize words automatically reduces cognitive load so that students can begin to comprehend, the ultimate goal of reading. Most importantly, theoretical and empirical accounts suggested that automatic word recognition is the most important and strongest predictor of reading comprehension in the early grades (Vallutino, Tunmer, Jaccard, & Chen, 2007). Benjamin Bloom (1986) published *Automaticity: The Hands and Feet of Genius* where he discussed the importance of automaticity for academic success. Research repeatedly supports the crucial role of automatic word recognition in reading success (Gough, 1984; Stanovich, 1991). Consequently, research is continually needed to document appropriate intensive interventions for students with significant disabilities especially in light of the potential impact of neuroscience and instructional design. If educators teach using specifically designed methods, their teaching

can build brain pathways for success for all, even and especially for students with significant intellectual disabilities (Allor et al., 2014; Burns, 2013).

Gaps in Functional Sight Word Intervention Research

Further research is needed to better understand individual student pre-intervention characteristics as these characteristics may affect the intervention results for varied student populations as well as individual students. Also, more opportunities for generalization to authentic community-based settings are needed to determine intervention effect on student independence gains. Knowing whether a student has had previous experience to a CTD intervention will also help researchers determine what timeframe is effective for student positive outcomes (Swain et al., 2015). Finally, using existing single-subject research designs as models for future research is needed to determine which interventions works best for individual students with varying disabilities (Mule, Volpe, Fefer, Leslie, & Luiselli, 2015).

Evidence-based Practices

This focus on providing effective and appropriate practice for all students has generated research needs. Special educators have attempted to define and determine a method for identifying evidence-based practices (EBPs) to serve as interventions in reading instruction (Cook et al., 2009). Reviews of studies on teaching students with significant disabilities, revealed the lack of research on the critical components of reading instruction (Houston & Torgesen as cited in Browder et al., 2006). These components are established by the National Reading Panel (NPR) and include phonemic awareness, phonics, fluency, vocabulary, and comprehension. Therefore, a need exists for research to determine which reading components require greater focus (Browder et al., 2006). In addition, there is a call for research to establish appropriate indicators for measuring or evaluating research quality. With quality indicators in place for

evaluating research as evidence-based, educators will have access to a critical knowledge base allowing them to choose the most promising interventions to meet the needs of each student (Odom, Brantlinger, Gersten, Horner, Thompson, & Harris, 2005).

Horner et al. (2005) explored the importance of using single-subject research to document research-based practices for use with students with disabilities. Single-subject research allows studies involving one participant or small participant groups. The authors suggested that single-subject research is especially relevant for special education practices. Special education is concerned with each individual and providing the most appropriate interventions that can be used by educators and families to increase potential success for these individuals. The authors contended that the components of single-subject research including individuality, detailed analysis, methodology, testing conditions, and cost effectiveness are especially relevant for determining specific evidence-based interventions.

In addition, research focused on the fields of clinical psychology, school psychology, and general education to find quality indicators and standards that could be applied to special education for determining EBPs (Cook et al., 2009). EBP standards were used including design, quantity, methodology, and effect magnitude. The methodology quality was determined by applying the quality indicators (QI) described in the Horner et al.'s (2005) study. These indicators are proposed for single-subject research (SSR) and include description of participants, description of setting, dependent and independent variable, baseline, experimental control, and internal, external and social validity. Cook et al. pointed out that their research review was the first application of the QIs and EBP standards for determining true evidence based interventions that can be used in special education.

Furthermore, there has been a gap in research to practice making it difficult for educators to determine the value of information they peruse in journals and other research (Reichow, Volkmar, & Cicchetti, 2008; Cook et al., 2009). As a result, the Evaluative Method for Determining EBP in autism was proposed. The method included rubrics, guidelines, and criteria for making EBP determinations. The criteria for EBPs were discussed in research including criteria for established and promising EBPs. The authors of this method suggested that these guidelines could be used as the field of special education, particularly the field of autism, seeks to validate a scientific method for informing educators of effective practices (Reichow et al., 2008). In addition, research needs a consistent method for description of participants involved in the study and specific guidelines for reporting findings. Guidelines need to be identified and followed in order for single-subject research designs to inform additional research (Spector, 2011).

For example, in a study reviewing the evidence base for sight word instruction for students with autism, nine single-subject studies were evaluated using Reichow et al.'s (2008) method to determine common procedures for interventions and found that sight word instruction with massed trials (flash card instruction) allowing the student many opportunities to respond was effective. Other key features of evidence based procedures included systematic prompting, visual supports, scaffolding task difficulty, differential reinforcement, use of least prompts, adult-directed intervention, and aligning task with student interest (Spector, 2011).

As mentioned earlier, students with significant intellectual disabilities are rarely taught using quality reading instruction. Students are usually taught using whole word methods as opposed to phonics based methods (Spector, 2011). A concern is that students taught in this manner may be prone to confuse words that look the same (Ehri, 2005). Another concern is that

students taught using sight word methods may be limited in reaching their literacy potential (Browder & Xin, 1998; Mirenda, 2003). However, there are noted benefits for teaching whole words especially for students with autism and others with significant intellectual disabilities. In particular, the lack of automatic word recognition has been identified as the essential obstacle for students with disabilities in learning to read (Fletcher, Lyon, Fuchs, & Barnes, 2007; Vellutino, Snowling, & Scanlon, 2004). The ability to read words in text is foundational to reading success (Ehri, 2005). The lack of word recognition is a determining factor in depicting those students who will have difficulty learning to read.

Students can learn through sight word instruction. They become motivated by their success, and this motivation becomes a beginning point to scaffold more comprehensive literacy components including phonemic awareness, phonics, fluency, and comprehension; the same components recommended by the NRP (Broun, 2004; Mirenda, 2003). However, educators must take into consideration the population being studied before determining the intervention as an EBP for a particular group of students (Spector, 2011).

Specifically, sight word instruction has been shown effective for students with a range of cognitive disabilities as well as for teaching other components of literacy (Browder et al., 2006; Browder et al., 2009; Casey, 2008; Waugh, Alberto, & Fredrick, 2011; Volpe, Mule, Briesch, Joseph, & Burns, 2011). Investigating evidence based interventions can inform researchers and educators as to appropriate strategies for students with varying degrees of significant intellectual disabilities (Lemons, Mrachko, Kostewicz, & Paterra, 2012).

Shortcomings in Schools

Reading performance for all students is a substantial concern for both practitioners and researchers (Regan, Berkeley, Hughes, & Kirby, 2014). For example, it is concerning that

students who have not been determined to have a disability including: 53% of Native American, 51% African-American, and 49% Hispanic students in fourth-grade were found not reading at grade level (Musti-Rao et al., 2015). This is the state of reading progress for students without disabilities. So, then how much more concerning is reading progress for students with significant intellectual disabilities with whom only one in five access even beginning literacy skills.

However, students with significant disabilities can develop reading skills given the appropriate instruction that is taught in an explicit, intensive, individualized, sequential, and consistent manner. Practitioners need evidence-based practices that have proven effective for students with varying exceptionalities. Additionally, they need professional development and training allowing them to implement practices with fidelity, appropriate resources, and ability to progress monitor so they can modify implementation as needed. Teachers need appropriate models of good instruction as well as mentoring to prepare them for the challenges of providing time-intense interventions (Allor, Mathes, Roberts et al., 2010; Allor, Mathes, Champlin, & Cheatham, 2009; Regan et al., 2014). Continuous research is needed to provide educators and policy makers with essential and scientific literature for determining evidence-based interventions for teaching reading to students with significant disabilities.

Statement of the Problem

Empirical research has repeatedly demonstrated the difficulty for students with significant intellectual disabilities to assimilate the complex components within the reading process resulting in their making limited progress in reading performance. Students with significant intellectual disabilities have limitations in working memory that interferes with their ability to decode words phonetically, recognize vocabulary, comprehend text, and read fluently. Therefore, many times students are not afforded the same opportunities to learn to read or even

recognize sight words as their peers without disabilities culminating in less reading exposure and ability. This lack of reading ability further isolates those who are already marginalized (Browder et al., 2006; Danforth, 2006; Klingner & Broadman, 2011; Regan et al., 2013; Musti-Rao et al., 2015; Volpe et al., 2011). Therefore, researchers and educators must determine the most effective interventions for students with significant disabilities and implement them consistently with fidelity in hopes of providing these students with a better quality of life now and later (Browder et al., 2006; Danforth, 2006; Mule et al., 2015; Musti-Rao et al., 2015).

Critically, researchers admit there are not ample studies to determine appropriate practices for all learners and studies are not in sufficient number to support special educators' needs for effective interventions (The Council for Exceptional Children's Interdivisional Research Group, 2014). Specifically, research regarding teaching reading to students with significant disabilities has been lacking in the field of special education (Allor, Mathes, Roberts, Jones, & Champlin, 2010; Allor, Mathes, Roberts, Cheatham et al., 2010; Browder et al., 2006). It has been suggested that educators have decided that students with certain IQs cannot learn to read; hence, the lack of research (Allor, Mathes, Roberts, Chetham et al., 2010; Browder et al., 2006).

Therefore. studying reading instruction appropriate for all students is an imperative for both general and special educators. Students with moderate to significant intellectual disabilities, including learning disabilities and autism, demand increased time and intensity for instruction to be meaningful and accessible for them (Denton & Otaiba, 2011). In addition, students with significant intellectual disabilities have limited cognitive capacity and working memory preventing them from processing information that is too difficult or complex (Greer, Crutchfield, &Woods, 2013). Cognitive Load Theory as well as the Cognitive Theory of Multimedia

Learning provides support for these processing difficulties stating that when the learning of complex cognitive tasks (reading) is too difficult and students are overwhelmed by the amount of information that needs to be processed, meaningful learning cannot take place (Baddeley, 2012; Greer et al., 2013). Cognitive Load proponents suggested that students must have control of this excessive load and that they need strategies that allow them to process information successfully (De Jong, 2010; Gerjets, Scheiter, & Cierniak, 2009). Furthermore, theorists suggested that learning conditions should be aligned with students' cognitive architecture (Pass, Renkl, & Sweller, 2004). For students with disabilities, the inability to process words automatically has been thought to be the most significant obstacle for learning to read in students with disabilities (Kamil et al, 2011; Flectcher et al., 2007; Vellutino, Fletcher, Snowling, & Scanlon, 2004).

Furthermore, theoretical and empirical research suggested that fluency in word recognition is determined to be the strongest predictor of reading performance in comprehension, with comprehension being the primary purpose for reading (Kamil et al., 2011; NICHD, 2000; Vellutino, Tunmer, Jaccard, & Chen 2007). Students with significant intellectual disabilities need interventions that allow them to become proficient at word recognition, freeing up mental abilities for comprehension (Flectcher, Lyon, Fuchs, & Barnes, 2007; Vellutino, Fletcher, Snowling, & Scanlon, 2004).

In particular, neuroscience has found that word level reading disability is characteristic of students with disabilities compared to those typically developing and suggested that it is important to target both phonological and orthographical knowledge to develop word recognition (Kamil et al., 2011). The area of the brain where these skills are developed is called the "word form area" and is said to become more active as students become proficient at word recognition. Studies provide evidence that when interventions are applied and practiced appropriately and

intensively, students' brain activation images can be normalized (Simos et al., 2002). Based on this research, providing students with significant disabilities with a word level reading intervention has potential for alleviating some of the working memory in the cognitive load allowing the students to focus their attention on word recognition until the words become automatic. Once the students have a repertoire of words that they automatically recognize, they can then benefit from understanding and comprehending connected text. Therefore, automatic word reading (sight word instruction) as an intensive intervention has the potential for supporting students' reading success as well as changing their brain activation processes leading to even greater future reading success.

Statement of Purpose

The ability to read is the most important academic skill needed for student success in school and for participating productively in society (Mule et al., 2015; Musti-Rao et al., 2015). As noted, students who do not learn to read have fewer opportunities and experience poorer living conditions and economic hardships (Browder et al., 2006). Particularly, it was stated that only one in five students with significant disabilities reach even low level literacy skills (Allor Mathes Roberts, Cheatham et al., 2010).

In addition, students with disabilities have limited cognitive capacity and working memory preventing them from processing information too difficult or complex. Cognitive Load Theory and Cognitive Theory of Multimedia Learning provide support for processing difficulties. Cognitive load theorists stated that when learning of complex cognitive tasks is too difficult and students are overwhelmed by the amount of information needing to be processed, meaningful learning cannot take place. Cognitive Load proponents also suggested that students must have control of this extreme load and that they need strategies that allow them to process

information successfully. Furthermore, theorists suggested that learning conditions should be aligned with students' cognitive architecture (Pass et al., 2004).

Therefore, students with significant disabilities need interventions that alleviate this cognitive load and allows them to free cognitive capacity for increasing reading performance. As discussed, research has found that the inability to process words automatically is the greatest obstacle for these students in learning to read (Kamil et al, 2011; Flectcher et al., 2007; Vellutino et al., 2004) and that fluency in word recognition has been cited as the most significant predictor of reading performance in comprehension (Kamil et al., 2011; NICHD, 2000; Vellutino, Tunmer, Jaccard, & Chen 2007).

Consequently, the purpose of this study is to address lack of research and focus on teaching functional word recognition. Students with low (Intelligence Quotient scores) IQs or those with memory processing deficits need evidenced-based interventions to make and maintain progress in reading. In addition, practitioners need evidence for what type of intervention will work with what populations so as not to waste precious time in providing appropriate instruction for these students. The study will provide additional evidence-based support for an intervention that allows students to access numerous words automatically to the point that word recognition does not cause high demand on working memory. This study will assess the impact of a functional sight word intervention implemented using a constant time delay procedure for four students with significant disabilities (determined by their most recently reported Intelligence Quotients (IQ) level or exceptionality). These students have been identified for special education, attend a summer campus transition program, and have not mastered sight words as determined by their present performance level on functional word probes.

Theoretical Assumptions

Based on the tenets of working memory limitations especially for students with disabilities and Cognitive Load Theory (CLT), my first assumption is that these students will learn words under the sight word condition of constant time delay because there will be less processing demands (De Jong, 2010; Gerjets et al., 2009). My next assumption is that these students will also exhibit more independence in accessing a specific community activity, for example, eating out at their favorite restaurants, going grocery shopping, accessing job-related environments, or reading community signs as a result of recognizing a repertoire of functional sight words.

As noted earlier, CLT suggests that learning new information is acquired more easily when working memory is not overloaded with task demands too difficult (Greer et al., 2013). Central executive functioning is associated with brain developments and is comprised of many processes. These processes include attention, working memory, and cognition. These processes are closely linked to reading and academic process in general. Associated brain regions with executive functioning develop from early childhood through adolescence when students are learning reading skills including word recognition and comprehension (Cartwright, 2012; Greer et al., 2013).

This research along with findings suggesting the malleability of the brain or what neuroscientist call plasticity, creates excellent opportunities for educators, opportunities that can change brain development in specific ways depending on instructional implementation. Therefore, neuroscience has great implications for teaching essential skills related to reading including word reading (Baddeley, 2012; Burns, 2013; Cartwright, 2012). This is what Gabrieli called “new science of learning” (as cited in Burns, 2013).

Based on this research and my assumptions, the research questions for this study are 1) Does using constant time delay when teaching functional sight words increase word recognition as measured in words read correctly at intervention; and 2) Do teachers and students find the use of the CTD procedure for teaching and learning functional sight words appropriate and effective? Answers to these questions drawing from empirical data in conjunction with existing research in the field for teaching functional sight word recognition and the evidence on brain pathways, will provide practitioners with more evidence on the effectiveness of CTD as a practice for teaching students with significant disabilities to read functional sight words. As already noted, there is a need for research regarding teaching essential reading skills to students with varying and significant intellectual disabilities. This research will provide evidence not only for teaching functional word recognition as a foundational skill for learning to read words in the community. Additionally, student motivation and confidence for continuing to assess higher order reading skills can be impacted.

Definition of Terms

Sight words are words that can be spoken automatically or immediately without pause; they are also known as high-frequency words.

Cognitive Load Theory suggests that learning new information is more difficult when the limited working memory capacity is overloaded with processing demands and information.

Cognitive Theory of Multimedia Learning was founded upon the Working Memory model and Cognitive Load Theory and considers the processes of cognitive load in association with limitations of the individual's working memory.

Working memory evolved from short-term memory theories but implies both storage and manipulation.

Intrinsic cognitive load is the the difficulty directly related to instruction.

Germane load is thought to be good cognitive load that is placed on working memory during learning.

Extrinsic load is load that disrupts the learning process.

Automaticity is the ability to read words effortlessly, without thought or processing.

Fluency includes the rate and accuracy measured as words read correct in a unit of time resulting in quality of reading and can include textual understanding.

Comprehension is the process of understanding what the text means and involves student abilities, text difficulties, and reading contexts.

Evidence-based practice is study that meet quality indicators for single-subject research.

*Functional sight word*s are words that students often see in the community in restaurants, at employment sites, at the grocery store, and around the community, for example, in signs.

Single-subject research is the rigorous method of describing behavior and determining evidence-based practices, useful for special education and for identifying appropriate practices for individual learners who need individualized interventions and strategies.

Significant intellectual disabilities define students at least three grade levels behind their typically-adjusting peers academically in reading performance and includes students with mild to moderate intellectual disability (45-70 IQ) and autism.

Constant time delay is a response prompting procedures that allows for near errorless responding, allows for the target stimulus and a prompt to ensure correct responding.

Fidelity is the degree to which the intervention is implemented as designed.

Adaptations are changes made to interventions to better match context, student population, and practitioners in an effort to provide sustainability.

Dependent Variables

Dependent variables included the following: 1) number of words read correctly (primary dependent variable); 2) number of sessions to reach mastery; 3) number of errors; and 4) number of minutes to reach master.

Significance of the Study

Most students with significant disabilities perform far below their typical peers and never gain foundational literacy skills. These students continue to slip further behind as the school years progress, leaving students vulnerable to behavior problems, dropping out, isolation, and being susceptible to lower living conditions (Coleman et al., 2015; Greer et al., 2013; Mule et al., 2015). What this means for students with significant intellectual disabilities is evidenced in the fact that research has found that many times educators assume students with significant cognitive disabilities simply cannot learn to process print. Consequently, what this means for students with significant intellectual disabilities is evidenced in the fact that only one out of five students with significant disabilities can read at beginning or foundational levels of literacy (Allor et al., 2010; Katims, 2001). However, research findings have indicated that students with significant disabilities including mild and moderate intellectual disabilities can make significant progress in reading when given appropriate time and interventions. More importantly, researchers maintain that their findings extend what is known about scientifically based instruction in reading as well as theories of reading development for students in general and have applied these findings to students with significant intellectual disabilities.

Moreover, research findings also suggested that IQ scores do not necessarily predict academic achievement levels and that IQ only accounts for 40% to 50% of what students can learn. This leaves other learning characteristics or variables responsible for approximately half of

academic outcomes. For example, studies have demonstrated that some students with lower IQs made faster progress in comparisons to students with higher IQs, highlighting the need to provide reading instruction to all students (Allor et al., 2014). Admittedly, research has found that students with significant disabilities do require greater supports than students with significant disabilities including: greater lengths of time, intensive and explicit instructions, support transferring and applying skills, and appropriate behavior strategies. Finally, research does confirm that students with significant disabilities do respond to reading instruction that consists of multidimensional literacy components (Allor et al., 2010; Allor et al., 2014).

In addition, for students with significant disabilities to comprehend, transfer, and generalize literacy skills, they need exposure to these skills throughout the school day in the classroom as well as in authentic settings. Authentic settings allow teachers the opportunities to provide instruction in the natural environments where students will use the learned skills. Students need occasions to develop academic skills including reading, writing, listening, and speaking skills. Research supports the use of community-based instruction to help students acquire and maintain what they have learned. Extensive, numerous, systematic, and individualized community-based instruction can be designed to meet individual student characteristics and provide an ideal setting for literacy skill development. In addition, time delay strategies have been found effective for teaching functional sight words and skill acquisition within a community-based instructional (CBI) framework (Ruppar, 2013). Research has suggested that students should practice these skills in both classroom settings as well as in authentic community settings to enable the students to transfer, maintain, and generalize the new skills. Also, research noted the importance of choosing skills that are relevant and meaningful for the individual student; for example, ordering from a menu of the student's choice, planning a

shopping list to use with grocery words, and/or planning a trip to utilize familiar street and other contextual signs (Steere & DiPipi-Hoy, 2012; Ruppar, 2013).

Providing a functional sight word intervention is a necessity for students with significant intellectual disabilities not only for teaching them community-based instructional words but for building a foundation and motivation for learning more complex literacy skills. As discussed earlier, students with significant disabilities are already marginalized and must attain basic skills in literacy to not only learn to read but also to have independent access to community activities and hopefully post-secondary opportunities. For many students' with significant intellectual disabilities, their inclusive opportunities will end when they graduate from high school. All students should feel valued and have the right to be challenged as well as participate in society and to be respected for who they are. Advocates for students with disabilities state that all students have the right to full citizenship and that opportunities to engage in higher education as well as employment are needed for these students to receive this citizenship. These advocates invite post-secondary institutions to address the needs of this population by committing to honor and respect all learners not just those who can attain certain academic goals and to provide "equitable spaces of belonging and a transition to somewhere where all students get to be somebody" (Aylward & Bruce, p. 46). Therefore, practitioners as well all educators at elementary, secondary, and post-secondary institutions including colleges and universities must seek interventions as early as possible that will allow students with significant disabilities to meet their goals and become an inclusive member of their community and society.

One essential challenge for determining appropriate interventions when teaching students with significant disabilities relates to the adaptations built into the instructional intervention allowing the intervention to be individualized for each student. However, research pointed out

that adaptations should be limited to only what is absolutely needed for students' success (Ruppar, 2013). This issue needs to be addressed in future studies because it relates to the fidelity (procedural and structural compliance) of the intervention implementation, and fidelity speaks to the strength of the evidence base for the intervention. However, when designing and determining specific interventions for students with significant intellectual disabilities, consideration of each student's characteristics including variance in disability type, cultural experiences, and current educational settings is essential for positive student outcomes. Implementation science (ensuring practitioners' maintenance of positive evidence-based interventions with students) seeks to close the research to practice gap by providing evidence based practices that have been determined to have high fidelity ensuring the internal validity of the study as evidence that student outcomes were, in fact, due to the intervention.

Consequently, a research to practice gap exists as a result of the restrictiveness for implementation of interventions. Therefore, research has stated that intervention designs should be built with flexibility that takes into consideration school, teacher, and student variability allowing teachers space to make educated and contextual decisions regarding implementation. Allowing this flexibility within implementation can lead to teachers maintaining implementation of effective practices resulting in students' positive learning outcomes. Essentially, interventions should have clearly identified, empirically validated, and understood components but allow for the flexibility that practitioners must have to address various student and contextural needs within the school environment (Cook & Odom, 2013; Harn, Parisi, & Stoolmiller, 2013).

Seeking to find what intervention is evidence-based for what student, in what context, and under what condition that will lead to the same positive outcomes that were found in structured research studies is necessary. Even though it is an educational fact that no one practice

or intervention will work for every student, well-designed intervention studies with well-defined student characteristics can provide an evidence base for an intervention with particular students. Consequently, this present research will provide the implementation of functional sight word instruction using a CTD intervention for teaching students with significant intellectual disabilities. CTD is a clearly defined intervention with distinct components that can be built to allow for adaptations that address varied student needs and still be found to produce positive student outcomes, and that is the ultimate goal of evidence based practices and interventions.

This research will also study CTD as a procedure for addressing what is considered the most efficient model for supporting reading development for students with significant intellectual disabilities as well as for all students. This model addresses the need to be able to identify words automatically to build a repertoire of sight words that can lay the foundation for future learning as well as provide the motivation to continue to learn (Kamil et al, 2011; Flectcher et al.,2007; Vellutino et al., 2004). In addition, empirical and theoretical research established the prominence of word reading in the development of comprehension, stating that fluent word recognition is the prime indicator for students in the first through third grade (Miller, 2009; Vellutino et al., 2007). Even more significant, is the recognition that reading is a complex and multicomponent process requiring the coordination of many skills. Brain imaging has delineated impairments in the brains of students with disabilities. These images help researchers determine specific interventions to address and support individual students. These targeted interventions implemented by skilled educators creates the possibility of changing and improving brain function and student cognitive outcomes (Papanicolaou, Pugh, Simos, & Mencl, 2004).

Research is needed to determine evidence-based interventions that will support students with disabilities as they learn to read. Questions in research that need to be asked include: what

kind of intervention, what intensity of instruction, what duration of intervention, what characteristics of students, and in which contexts (Allor, Champlin, Gillford et al., 2010; Allor Mathes, Jones et al., 2010; Allor, Mathes, Roberts et al., 2010). Empirical studies are needed to determine interventions with proven effectiveness for educators to implement with confidence as well as with fidelity. These interventions must be extended as long as the need to produce significant outcomes and individualizing as appropriate for each student.

Therefore, this study will seek to answer questions relevant to student characteristics, interventions type, and contexts to determine if a functional sight word procedure has the effect of increasing number of words recognized as well as providing increased community based opportunities for students with significant disabilities. Applying the appropriate intervention at the appropriate time may change a student's cognitive performance and their lives.

Scope of the Study

The scope of this study will help to answer the research questions that allow educators to determine appropriate and effective interventions to support individual student's cognitive processes while learning to read. In addition, the scope and intentions of this study also include answering the critical question for special education as for whom the intervention works, where the intervention works, what intervention works, under what conditions does the intervention work, and for what reason does it work (Klinger & Broadman 2011). With the answers, it is hoped that this study will add to the existing research to address the reading needs of students with disabilities and simultaneously aid the field of special education to begin to close the research to practice gap for providing appropriate and timely interventions for students with significant disabilities (Musti-Rao et al., 2015; Regan et al., 2014).

Summary

This chapter has provided an overview of the significance for providing sight word intervention research that evaluates how student word recognition and automaticity may increase functional sight word recognition and community based skill development outcomes for students with significant intellectual disabilities. A discussion of how reading interventions for this populations has been used in the past to address the gap in reading for students with significant intellectual disabilities as well as those with less significant disabilities and noting how instructional interventions have changed over time will be presented in Chapter II. This research will provide reading evidence-based practices that can be used in a variety of classrooms and contexts. Evidence-base practices in reading for different populations of students with disabilities is scare and can benefit from situation and student specific studies in the area of reading (The Council for Exceptional Children's Interdivisional Research Group, 2014).

Specifically, this research study will use Swain, Lane and Gast, (2015) as a model for research design. Swain et al. compared the effectiveness and efficiency for using CTD as response prompting procedure for teaching functional sight words to students with significant disabilities. This research body found that the interventions were effective for teaching word recognition to each of the study's population. The authors stated that further research needs to be applied to better understand interventions and combinations of interventions effect for sight word recognition. The authors also suggested the need for researchers to have a clearer pre-intervention understanding of participant's cognitive characteristics to better understand the impact of these characteristics on intervention effectiveness. The next chapter will provide a theoretical framework as well as a review of the literature that has guided this research project.

CHAPTER II:

THEORETICAL FRAMEWORK

Understanding the relationship between neuroscience and learning necessitates greater attention to creating and providing explicit and intensive interventions in appropriate contexts for students as early as possible. Burns (2013) stated that the brain is malleable and this is what allows students to learn in the first place. Therefore, producing quality research on evidence-based interventions that allow educators to teach in a prescribed manner is essential. These interventions can establish connections of pathways in the brain that are needed for learning math and reading.

Activity in the brain correlates with academic learning. The outer layer of the brain is called the cortex and is divided into the occipital lobe in the back of the brain and the frontal lobe in the front of the brain. The occipital lobe is associated with visual processing. The frontal lobes and the functioning in this area are associated with Executive Function (EF) that allows for children and adults to control their behavior. Other processes of the EF include attention control, cognitive flexibility, inhibition, initiation, metacognition, organization, planning, responses, self-regulation, shifting (changing focus), and working memory (WM). Humans are born with all the neurons they will have throughout their life. As individuals develop, brain weight increases due to neurons' dendrites that multiply, growth of neurons' axons, and the forming of new synapses. In addition, myelin works to insulate the neurons and supports neural communication. Individual experiences determine which synapses are maintained and which are pruned or removed. The prefrontal and frontal areas of the brain parallel EF (Cartwright, 2012).

Because EF parallel brain region development and that development occurs from early childhood through adolescence, research in this area can provide implications for reading instruction. Furthermore, students' ability to control their own behavior, a component of EF, has been positively correlated with word reading ability in the early grades. WM is related to word reading ability, shifting, and attention; while comprehension is associated with planning, WM, and inhibition. Taken together, research suggested the importance of EF in reading success (Cartwright, 2012; Deater-Deckard, Mullineax, Petrill, & Thompson, 2009). Research in reference to EF stated that specific interventions including those that focus on the features and meaning of words can support student EF growth for reading behaviors especially for students with significant disabilities who have limited working memory. Other research indicated that brain imaging can supply information regarding a student's response to particular interventions (Rezaie, Simos, Fletcher, Cirino et al., 2011). Consequently, regional brain activity imaging demonstrated that students with reading disabilities have atypical patterns in the cortical areas for reading. These students exhibit dependence on the prefrontal and right cortices which is ineffective for word reading (Rezaie, Simos, Fletcher, Juranek et al., 2011).

Neuroimaging methods are used to determine the extent of activity throughout the brain during word recognition activities and can examine the semantic, phonological, and orthographic processors within the brain as well as measure the extent of interactions among these processors. These images also inform researchers as to the extent of the changes in brain activity as a result of effective interventions (Roberts, Christo, & Shefelbine, 2011). According to neuroscience approaches, beginning readers use mostly the right hemisphere of the brain (tempoparietal and frontal regions); however, as word recognition develops in students, the left hemisphere ventral system becomes more involved. This system encompasses semantic, linguistic and maybe even

visual functions. This line of research suggested more complex literacy processing as word recognition skills developed. Neuroimaging also indicated that students with significant intellectual disabilities exhibit more dependence on left frontal (Broca's area) and right frontal (visual memory) processing areas with less activity in the area known as "word form area" than is seen in typical students who are proficient readers. (Berninger & Richards, 2002; Flectcher et al., 2007; Hoeft, Meyer, Glover, Kobayashi, Mazaika et al., 2007; Rezaie, Simos, Fletcher, Cirino et al., 2011; Rezaie, Simos, Fletcher, Juranek et al., 2011).

Additionally, research suggested that specific areas of the brain are activated during word reading and other literacy processes. This activation, however, shows different patterns for students with reading disabilities in comparison to typical readers. Research confirms that the occipitotemporal and the area in the posterior of the middle temporal gyrus in the brain shows activation for beginning reading skills. Brain imaging also suggested that students with reading disabilities do not use the left temporoparietal for phonological processing associated with word recognition skills; instead, they use their inferior frontal and right posterior temporal cortices. Studies suggest that these patterns in inefficient readers can be reversed in response to intensive interventions. Some studies have found that changes in brain activity demonstrated more normalizing activity for word reading after interventions (Simos et al., 2002; Simos, Fletcher, Sarkari et al., 2007).

Theoretical research supports the relationship between neuroscience and learning, specifically word reading. These three include limited Working Memory Theory (WMT), Cognitive Load Theory (CLT), and Cognitive Theory of Multimedia Learning (CTML). Combining the underpinnings of these three cognitive theories provides an understanding of students' (with significant intellectual disabilities) cognitive limitations as well as evidence for

determining intensive interventions for developing critical pathways in the brain that will lead to student literacy learning, especially automatic word learning.

Braddeley (2012) discussed three components that work with WM including central executive (CE) and two subsystems consisting of a visual/spatial and a phonological loop auditory processor. He stated that the CE coordinates these processes as well as helps focus attention and supports communication with long-term memory. The visual/spatial processor stores spatial information and creates and supports interpretation including sequential presentation and recall while the phonological loop is responsible for storage including vocal and subvocal rehearsal (Braddeley, 2012; Greer et al., 2013). These components work together to support student processing of new information.

In addition to WMT, CLT, attributed to Sweller (Pass, Renkl, & Sweller, 2003) began in the 1980's and has continued to gain consideration into how students learn, and how, consequently, instruction should be designed. CLT builds upon the limits of WM as it asserts that students have difficulty learning new information when the task demands and processors overload WM capacity. Three types of cognitive load have been identified including extraneous, intrinsic, and germane. Germane is considered appropriate; intrinsic is determined by the level of difficulty presented by the instructional design and the context in which it is presented; extrinsic complicates learning by allowing unnecessary and distracting information. In addition, cognitive processes including visual, perception, and attention are said to be affected by cultural factors as student learning is mediated by their social being including their race, ethnicity, gender, and class. These findings for cognitive load theory are essential for reading instruction in that instruction can be made relevant for students by helping them prioritize information into schemas. These schemas include cultural knowledge and can help organize many components of

knowledge into a single component that can be stored in long term memory (LTM) and make learning more efficient.

Automaticity of learning is another way to make learning more efficient, helping reduce cognitive overload. When students process schemas automatically, they do not rely on conscious efforts, and working memory resources are allowed to be used for other learning. In reading, when students know words automatically, their working memory resources can be used for text comprehension rather than decoding. This makes cognitive load more manageable (Kamil et al., 2011).

Working memory theory espoused by Baddeley (Greer, 2013) and Cognitive Load Theory espoused by Sweller (Greer, 2013) were used to develop Cognitive Theory of Multimedia Learning (CTML). CTML supports the use of multimedia learning to ameliorate the learning process for students with disabilities. Multimedia learning allows students to access information through their auditory and visual channels lessening the extraneous cognitive load affecting working memory, thus, reducing distracting information and allowing resources to be freed for learning the relevant information. CTML suggested that intervention design can address the issues of cognitive load and support working memory positively influencing student learning (Baddeley, 2012; Greer, 2013).

For this study, these three theories work together to provide a foundational basis for the importance of automaticity in word recognition for all students but especially for students with significant intellectual disabilities who have considerable limitations in working memory. Reading research indicated that automatic word recognition is critical for students to move beyond word level reading and begin to gain understanding from text, allowing the reader to focus on meaning and not simply the print representation of the word. In addition, word

recognition fluency is said to be necessary for all alphabetic languages. Therefore, understanding how students acquire word level reading fluency is a basic component for any theory of reading. Measures of students' ability to read individual words correlates highly with reading success and can predict reading difficulties, suggesting that automaticity in word reading is essential for reading proficiency (Ehri, 2005; Fuchs, Fuchs, Hosp, & Jenkins, 2001; Good Simmons, & Kame'euni, 2001; Share, 2008a; Vellutino et al., 2004). Considering this research-base highlighting the importance of word recognition for the development of reading skills, it is essential that researchers seek out the most effective intervention and procedure for supporting this skill development and at the same time ensuring that the intervention meets specific student characteristics.

Two other theoretical areas also have implications for determining the appropriate intervention for students with specific and significant disabilities. These two areas include behavior and social-emotional needs. Saeki and Quirk (2015) discussed the importance of meetings student's basic psychological as well as social-emotional needs before addressing student engagement concerns. In their study addressing student engagement, they found a relationship among student engagement, social-emotional and behavior, and the extent to which student's basic psychological needs are met. The authors further discussed the need for students to feel that they are competent to successfully complete a specific task, stating that schools should foster the development of strategies that allow students to feel they have autonomy as well as feel that they can relate to the classroom environment. Behavior momentum is a fluency building intervention that can be used by researchers and educators and allow tasks to be designed individually and increase student confidence to persevere when task become difficult and can be embedded within academic interventions (Johns, 2015; Kelly & Holloway, 2015).

Corroborating these findings, Patrick, Ryan, and Kaplan (2007) found that social-cognitive motivational theories support a relationship among students' perceptions of classroom environment, student engagement, and student self-efficacy (student belief about their own ability to complete a task or assignment successfully). The authors suggested the findings from their study investigating the adolescent student's perceptions of the classroom social culture, motivation, and engagement as well as their self-efficacy beliefs can determine behavior and cognitive engagement with academic tasks. As discussed, when seeking to determine the most appropriate intervention researchers must seek to understand student characteristics, motivation needs and cultural experiences and the contextual features of the educational environment where the intervention will be implemented (Harn et al., 2013; Ruppar, 2013).

Expounding further upon the social theories of learning, Chavis (2011) pointed out that the social learning theory is one of the more recent theories for addressing human concerns within their social context. Social learning theory is based in traditional learning theory that occurs in culturally situated contexts. Individuals can learn by observing what is going on around them through observational learning, imitation, and modeling. Educators can enhance student learning potential by applying theory and understanding of human behavior and development. Theory determines practice that results in evidence-based practices that produce successful outcomes in cultural and social contexts. Seeking to acquire knowledge, skills, and understanding of behavior (academic and social) as part of human development and taking into consideration the importance of each student's culture, values, and heritage, especially students with significant intellectual disabilities, promises interventions designed to address individual needs in social contexts.

Academic Needs of Students with Significant Cognitive Disabilities

Evidence-based practices are critical for students with significant disabilities to have academic success. These practices enable teachers to create positive learning opportunities for all students (Browder et al., 2006). The inclusion of students with cognitive disabilities in the general education environment has prompted researchers to focus again on functional and academic skills (Browder & Xin, 1998). Students with moderate intellectual disabilities can benefit from not only functional academics such as sight words but also curriculum-based instruction (Fredrick, Davis, Alberto, & Waugh, 2013). One study demonstrated that all five participants mastered word-analysis skills enabling them to sound out words and phrases. Furthermore, word analysis is learned by applying strategies permitting students to generalize their new knowledge to unfamiliar information (Fredrick et al., 2013). However, a criticism for sight-word instruction is that this method for teaching reading to a specific population limits more complex instruction in the needed foundational reading skills (Fredrick et al., 2013). In other words, the criticism is that teaching only sight words prevents students from developing greater literacy skills in decoding, fluency, and comprehension. In contrast, a meta-analysis suggested that sight word instruction had the strongest evidence base for teaching students with cognitive disabilities. Some evidence was cited for teaching, comprehension using visuals but little evidence for phonics phonemic awareness, or fluency (Browder et al., 2006).

Teachers need strategies to develop appropriate reading instruction for students with cognitive disabilities. There are identified factors that warrant consideration including level of intensity, appropriate skills, motivation, and practice (Allor, Champlin, Gifford, & Mathes, 2010). Additional components of a successful program include activities that are systematic, explicit, repetitive, fast-paced, and motivating. Also, educators must model for student how

learned strategies can be generalized to new and unfamiliar information and contexts (Allor, Mathes, Jones, Champlin, & Cheatham, 2010). Students with cognitive disabilities need more opportunities to engage in reading and responding to appropriate levels of carefully selected connected text in small group settings (Denton & Otaiba, 2011).

Accordingly, students learn and retain more information including sight word acquisition when opportunity to respond (OTR) is greater. In a study for sight word acquisition, a drill method with 10% unknown words to 90% known words was found effective. Furthermore, research has found that retention of learned sight words was 40% to 60% for a moderate OTR condition and up to 72% to 92% for a high OTR condition (Burns, 2007) suggesting that students with significant disabilities need many opportunities to practice what they know. Also, instruction should be intensive and highly interactive with longer sessions. The issue of time is critical for creating positive outcomes for students with significant disabilities. Allor, Mathes et al. (2010) suggested that "achieving this success has taken a long time and has required persistent, careful instruction tailored to individual student progress and needs. Common instructional needs included struggles with memory, application of skills, mastery, and language" (p. 11).

Other instructional factors essential for reading instruction included observational and incidental learning as well as visual presentations. Observational and incidental learning (learning non-target words or information of others) occurs when students are taught in small groups and can observe the behavior of other students. Research has reported that 92% of the participants mastered observational target information and 89-96% of incidental information (Ledford, Gast, Luscre, & Ayres, 2008). Small group instruction is an effective alternative to individual instruction for students with autism and other cognitive disabilities and includes the

added benefits of socialization and generalization for students taught systematic instruction in a small group setting (Ledford et al.) Research has shown the effectiveness of a smart board intervention provided in a small group setting for sight word acquisition documenting that students increased in their word learning, especially when the information was presented on a large screen (Mechling, Gast, & Thompson, 2008). Consequently, smart board instruction resulted in higher gains in word reading, for this study, than traditional sight word instruction.

Another important component of teaching for students with significant disabilities is visual learning. The Oelwein Method utilizes all learning styles especially visual. Students learn words through a series of activities including matching, selecting, and naming. Pictures are matched to words allowing the teacher to monitor comprehension. Students can quickly progress from words to sentences (Broun, 2004). Using a color cue to highlight orthographic and phonological features of words can be effective for teaching word reading enabling students to read more words with the cue present. However, other types of cues could be just as effective. (Mesmer, Duhon, Hogan, Newry, Hommema, Fletcher, & Boso , 2010).

Using technology has been demonstrated to be an effective medium for increasing sight word acquisition. Research continually advocates for the importance of individualizing instruction for each student when using computer-assisted instruction (CAI) as a sight word intervention medium. Students with cognitive disabilities vary and need careful attention to their individual learning characteristics (Randi, Newman, & Grigorenko, 2010). It is critical, for example, to find the best match between student and computer program creating opportunities for much success (Lee & Vail, 2005).

Student characteristics should be considered before deciding which evidence-based practice to implement in the classroom (Spector, 2011). For example, student populations with

intellectual and learning disability learn from specific and explicit intervention instruction, direct instruction, constant time delay, and interspersal of known material (terms defined in following sections). However, the two populations differ in their learning gains and ability to transfer. Research documented that students with intellectual disability improved more with a constant time delay than with an intersperal intervention intervention, but that students with learning disabilities made academic gains with both strategies (Caffrey & Fuchs, 2007). Research has shown that personal information should be used to design reading activities (Broun, 2004). Student choice is one way to consider what instructional methods and strategies are the best fit for an individual student (Browder & Xin, 1998). In essence, research should focus more on individual needs rather than group needs when planning activities and strategies (Browder & Xin, 1998).

In addition to providing the appropriate intervention is performing meaningful assessments to document effectiveness of the instruction and to further inform teaching. Research specifies four types of assessments in providing appropriate reading instruction. These include formative assessments including screeners, diagnostic assessments, and progress monitoring for providing pertinent information about student progress. The fourth type of assessment is summative, informing the educator of whether or not the student has mastered the set goals (Denton & Otaiba, 2011).

When designing instruction for students with significant disabilities, educators must consider providing interventions allowing access to less restricting and less marginalizing, and more inclusive placements. Many literacy practices that benefit typically adjusting students will also benefit students with disabilities (Browder et al., 2006). Students with significant disabilities

must be allowed to benefit from the same quality literacy programs as used with their typically adjusting peers (Katims, 2000).

Overview of Evidence-Based Practices of Literacy Instruction for Students with Significant Disabilities

Research supports practices in reading instruction that can be used with students who have significant cognitive disabilities. These students exhibit challenging behaviors that must be taken into consideration when determining appropriate practices to be used in the classroom. When determining appropriate procedures for delivering instruction whether through technology, direct instruction, or other methods and procedures, it is important to determine the theoretical framework for selecting the particular procedure for use with a specific population (Browder et al., 2009). The National Research Council Committee (2002) proposed scientific principles for research including that research should be linked to theory. In addition, quality indicators should be used to measure whether or not a particular intervention meets specific criteria, as discussed earlier for Horner et al., (2005). Research also suggested that using sight words with time delay to teach students with moderate disabilities is effective and that there is reason to believe that this form of instruction can be effective for students with severe disabilities as well. Furthermore, evidence exists for using this method with pictures as well as for implementation in the general education classrooms (Browder et al., 2009). In addition, educators should understand the difference between a functional and a causal relationship when interpreting results from various research studies. A functional relationship can predict a relationship between variables and be used to make implications about future outcomes but is not as predicative as a causal relationship between variables (Bailey, Angell, & Shannon, 2012). Considering the implications of a causal or functional relationship between variables being studied can inform educators' decisions

regarding the appropriateness and usefulness of a given intervention. The following section will provide an overview of evidence-based methods and procedures for sight word interventions.

Technology

Research has found that the use of multimedia technology can enhance reading achievement, specifically word reading skills, as well as student enjoyment for students who struggle to develop basic literacy skills. One study demonstrated that students made significant gains in word recognition, word naming, and phonological awareness. Seventeen young students were provided a traditional big book intervention as well as a whole-word multimedia program. The authors stated that gains were made on measures for literacy, but that the multimedia intervention provided greater gains in word recognition and enjoyment (Karemaker, Pitchford, & O'Malley, 2010).

However, a study comparing the effects of using simultaneous prompting (SP), discussed later, with a teacher-directed intervention (traditional sight words flashcards) and a computer-assisted sight word intervention found that all three participants made gains in sight word acquisition. Interestingly, all students preferred the teacher-directed implementation even though both conditions were effective (Coleman et al., 2015). Similarly, in yet another study, the authors compared computer-assisted instruction with teacher-directed and found that both conditions supported student engagement but that the teacher directed interventions produced greater gains in word identification and reading fluency. Also, social validity measures demonstrated that students preferred both conditions (Bryant, Kim, OK, Kang, Bryant, Lang, & Son, 2015).

In the same way, iPads and sight word applications have also been shown to produce similar literacy gains. In a study using an iPad and applications addressing word skills of a fifth grade student who was reading at least two years below grade level, the authors found that the student

gained one year's growth in reading in six weeks. Such improvements in one students, even though not generalizable, suggested that iPad use may also be a valuable medium to use for implementing sight word interventions with students who struggle to read (McClanahan, Williams, Kennedy, & Tate, 2012).

Computer programs for teaching sight words should be considered as part of the literacy instruction for students with significant cognitive disabilities (Lee & Vail, 2005). One study included four students with behaviors consisting of limited social interaction skills, communication difficulties, difficulties taking turn, lack of eye contact, inappropriate language, physical aggression, and difficulty with task completion. A constant time-delay (CTD) procedure was implemented. A constant time delay procedure (discussed more in next section) allows for a set amount of time for the student to respond. Research findings suggested that a computer program using CTD and multimedia components was effective for teaching sight words to students with significant cognitive disabilities and those who have challenging behavior characteristics. In addition, studies have demonstrated that students learned incidental information and were able to generalize their new knowledge to other contexts (Lee & Vail, 2005).

Substantiating these results, a study investigating a sight word intervention with students with intellectual disability using simultaneous prompting compared a computer-assisted condition and a traditional flashcard teacher directed condition. Simultaneous prompting is another procedure for teaching sight words that allows for a cue (written word) to be given while the teacher states the word (controlling prompt) with the student immediately repeating the word. This prompting procedure is evidence-based for teaching sight words and allows for near errorless responding (Coleman et al., 2015; Waugh, Alberto, & Fredrick, 2011a). The results of

this study indicated that both teacher-directed and computer-assisted simultaneous prompting increased student sight word acquisition. The study did find that the participants in this study preferred teacher-directed instruction. Additionally, studies on computer-based sight word reading intervention (CBSWRI) has demonstrated effectiveness for teaching a student with autism. Furthermore, researchers pointed out that the computer-based intervention takes little time away from other literacy instruction (Yaw, Skinner, Parkhurst, Taylor, Booher, & Chambers, 2011).

Interestingly, both smart board instruction and traditional flash card instruction produced successful outcomes in teaching sight words to students with significant disabilities. More specifically research found that the visual presentation of information on a large smart board screen was effective for increasing sight word knowledge as well as non-target words (incidental learning). This use of a large-screen may save time and increase learning potential for students with significant disabilities (Mechling et al., 2008). In another study, researchers investigated the preferences and effectiveness of using low to high technology instructional tools including flashcards and iTouch with this population of students, and found that even though the students preferred the iTough to the flashcards, the high technological instruction did not provide greater gains in acquisition of sight words than the traditional flashcard methods (Jameson, Thompson, Manuele, Smith, Egan, & Moore, 2012).

In yet another study, the authors maintained that their research demonstrated that an interactive computer program, Kurzweil 3000, provided opportunities for students with significant disabilities to reach target sight word goals, maintain 80% of acquisition, and generalize by reading learned sight words in sentences. The authors stated that this study provided support for the use of the Kurzweil 3000 computer-assisted instruction (CAI) which

consisted of engaging activities for students. They noted that most CAI only involved one activity and suggested that further research analyze the effects of various activities (Cullen, Alber-Morgan, & Wheaton, 2013). Nonetheless, Jameson et al. reinforced that the quality of the information being taught was more important than the medium used to deliver content. They cautioned that only limited literature exists discussing the tenets for using multimedia devices as well as research supporting the use of these devices as an evidence-based intervention for these students. The authors pointed out the need to validate the use of these instructional devices as interventions for students with significant disabilities.

Video modeling and video self-modeling (VSM) is another high tech device that is gaining increased attention for teaching. Research indicates that VSM can be an effective evidence based intervention for students with autism spectrum disorders (ASD) in the areas of communication, social skills, behavior, and on-task behaviors (Gelbar, Anderson, McCarthy, & Buggey, 2012). A research review for the effectiveness of VSM as an effective intervention for teaching students' academic skills found only a minimum of studies that met selection criteria. The authors explained that researchers in these studies created videos of students exhibiting appropriate behaviors in the instructional areas of letter identification, answering questions, solving math problems, participating, and staying on task throughout a lesson. The authors found that that VSM did increase appropriate behaviors and that behaviors were maintained except in the area of writing. Specifically, in reading, VSM increased student gains in oral reading fluency that were maintained over time. In addition to reading more words per minute, the authors verified that comprehension skills increased especially when VSM was combined with tutoring (Prater, Carter, Hitchcock, & Dowrick, 2012). VSM is promising for meeting academic goals for

students but needs further research to validate it as an evidence-based practice for teaching students with significant disabilities (Gelbar et al., 2012; Prater et al., 2012).

However, traditional low tech sight word instruction has also been found effective for teaching students with significant disabilities as well as other students who struggle to learn to read. The next section will discuss research based interventions for using sight word instruction as a foundation for learning broader literacy skills for students with significant cognitive disabilities as well as for students with a variety of reading disabilities.

Methods for Teaching Sight Word Instruction

Direct Instruction (DI) is a research-based, systematic, and effective method for teaching students with a variety of disabilities (Ruwe, McLaughlin, & Derby, 2010). It can be used as a flashcard system to teach a variety of skills across multiple academic areas and allows for error correction and immediate feedback with teacher correction and modeling, teacher and student practice, and student independent practice for repeated trials at determined intervals (Bishop, McLaughlin, & Derby, 2011; Hopewell, Mclaughlin, & Derby, 2011). Classroom teachers as well as other adults and peers can implement this intervention. A ratio of known to unknown words is important to provide motivation and engagement (Crowley, McLaughlin, & Kahn, 2013). In addition, direct instruction can be combined with other interventions, procedures, and conditions to create the most appropriate intervention package to meet the specific needs of an individual student.

Interventions can consist of a variety of components including direct instruction and picture books to teach letter-sound correspondence for students with development delays (Bailey et al., 2012); reading racetracks, direct instruction, and a token economy (behavior management system) for students with significant intellectual disabilities (Hopewell et al., 2011); and direct

instruction, passage reading, and error correction for students with intellectual disabilities (Ruwe, McLaughlin, Derby, & Johnson, 2011).

Reading racetracks is a systematic intervention for teaching discrete trials for academic skills and has been packaged with direct instruction in many research studies producing positive gains in sight word and specific skill acquisition (Bishop et al., 2011; Crowley et al., 2013; Hopewell et al., 2011; McGrath, McLaughlin, Derby, & Bucknell, 2012). Reading racetracks utilizes a track template divided into 28 cells. The cells allow for discrete information. The goal is for the student to complete the race in a set amount of time, for example, reading as many sight words as possible in one minute (Hopewell et al., 2011). Reading racetracks has a functional relationship to sight word acquisition and is effective, low-cost, and motivational for students (Crowley et al., 2013; McGrath et al., 2012).

Direct instruction has many positive aspects as it can be implemented by a variety of individuals from educators to peers and is motivational and effective for many students with a variety of disabilities (Bishop et al., 2011). Conversely, there is concern in the literature that warrants attention. The evidence supporting direct instruction as the single most effective intervention for improving reading ability may lead educators to overlook certain variables including effectiveness of other interventions, teacher role in student achievement, and results of longitudinal studies for specific populations (Ryder, Burton, & Silberg, 2006).

A longitudinal study of the effects of direct instruction for first to third graders found no evidence of any significant difference among approaches to teaching phonics nor did they find that direct instruction increased teacher effectiveness. In contrast, the authors stated, it is the particular teacher characteristics not teacher prescribed methods that increase student performance and led them to question the value of teacher-scripted instructions (Ryder et al.,

2006). Their findings "suggest that effective instruction of DI and non-DI teachers is not characterized by conformity and adherence to a structured instructional paradigm, but, rather, it is based on intuition, student need, and previous training" (Ryder et al., 2006, p. 189).

Some students with significant cognitive disabilities may be non-verbal. Thus, their unique needs must be considered when designing instructional intervention packages as research supports that many students with cognitive and verbal disabilities can learn literacy skills (Fossett & Mirenda, 2006; Mirenda, 2003). One intervention that can be used with students with limited verbal ability is a procedure called picture to text matching. Many researchers believe the use of pictures prevents or "blocks" novel sight word learning. However, Fossett and Mirenda (2006) found that picture-to-text matching (PTM) can be effective when used in a systematic and active manner. The paired associate (PA) procedure consisted of the written word paired with the picture communication symbol (PCS) to teach sight words; while in the picture-to-text procedure, the PCS was kept separate from the written word.

A study comparing the result of PA procedure to the PTM procedure with two ten-year-old boys with developmental disabilities for learning sight words documented that both boys in this study mastered the PTM words but not the PA words leading the authors to state that the PTM intervention was more effective for teaching sight words than the PA intervention for this population. Picture symbols can be used to teach sight words when students are actively involved. Furthermore, students who are nonverbal can be involved in literacy instruction with a PTM intervention. Also, the PTM procedure allowed for generalization of sight word learning to new situations (Fossett & Mirenda, 2006).

Procedures for Conducting Sight Word Instruction

Time delay responses can include a constant time delay (CTD) or a progressive time delay (PTD). Both are known as response prompting procedures. The teacher provides a stimulus and assists the student to provide the appropriate response with use of simultaneous prompting, constant time delay, or progressive time delay. The delay between instruction and prompt is increased from 0 seconds to 4 or 5 seconds as needed depending on student correct responses. Prompts are faded as students' ability to respond correctly increases. Simultaneous prompting reduces occurrences of errors (Browder et al., 2009; Casey, 2008; Waugh et al., 2011a).

Constant time delay, progressive time delay, and simultaneous prompting (Cohen, Heller, Alberto, & Fredrick, 2008; Waugh et al., 2011a; Waugh, Fredrick, & Albert, 2009) are evidence-based. Constant time delay and progressive time delay are structured interventions and increase positive student interactions with the environment, are flexible procedures, and can be implemented early (Walker, 2008). Constant time delay refers to an intervention that can be used to teach sight words or blending skills to students. The procedure involves providing the student with instruction and a prompt. In the beginning, a student may receive the instruction and prompt simultaneously. As the instructional sessions progress, the instructor may provide delay times for a number of seconds and decrease the delay as the student begins to master the skill (Cohen et al., 2008; Waugh et al., 2009).

Simultaneous prompting (discussed earlier) is an intervention allowing for the presentation of the instruction and prompt to occur at the same time. This provides opportunities for students to experience near errorless learning (Alberto, Waugh, Fredrick, & Davis, 2013). Simultaneous prompting with and without error correction can decrease errors and increase rapid rates of word acquisition for students with moderate to significant cognitive disabilities.

Research provided further evidence of simultaneous prompting as an effective intervention for teaching sight word acquisition to students with significant disabilities Adding error correction during assessment probes increased the efficiency of this intervention. Consequently, adding error correction allowed students to make gains in fewer sessions, increased number of correct responses, and required less time (Waugh, Alberto, & Fredrick, 2011 a & b).

Research within a literature review conducted to determine the effectiveness of CTD and PTD for use with students with autism like characteristics found that both procedures were effective for teaching this population and can be implemented in various settings, instructional arrangements, and with different adults as instructors. Furthermore, both procedures were found similar for number of 0-secondecond delays, behavior management, generalization, and procedural reliability. CTD studies did result in more errors for this study, required more modifications in procedure, and longer delays for transfer of stimulus control than the PTD studies (Walker, 2008).

The difference between CTD and PTD is in how the delay is provided. For constant time delay, a random delay is set; for progressive time delay, the delay is reduced depending on correct responses. Progressive time delay procedures are documented as producing less error (Casey, 2008). Within-session time delay and across-session time delay are two conditions that can be used with time delay procedures. Within-session time delay allows for an increase in the delay of the controlling prompt by one second before the next trial or word is presented. Across-session time delay allows for an increase in the delay after each session. Results of the interventions demonstrate that the progressive time delay within-session was more effective for producing more correct responses with less error. Teachers preferred the across-session time delay to the within-session time delay procedure because of the ease of implementation.

However, this procedure was stated as ineffective, and the author warned that this underscores the research to practice gap and cautioned educators to recognize the importance of choosing the appropriate interventions and procedures so that instructional time is not wasted (Casey, 2008).

Two other methods of sight word interventions including traditional drill (words not known by students) and incremental rehearsal (includes known and unknown words) were implemented with four six-year-old students with reading difficulties. Traditional drill (TD) provides sight word instruction to students using unknown words. Incremental rehearsal (IR) is a form for interspersal training. Intersperal training includes known words as part of sight word instruction by interspersing the known words within the group of unknown words. Incremental rehearsal is a form of interspersal training but allows for unknown words to be presented incrementally (Volpe et al., 2011). The effectiveness for establishing a ratio of 90% known to 10% unknown words during instructional sessions created high rates of opportunities to respond and was discussed earlier (Burns, 2007). The authors concluded that no one intervention was better and admitted that for one student participant, neither method was effective. The authors suggested that this leads to the conclusion that no one practice will be best for all students with disabilities. However, the authors did note that drill practices can be implemented in the general education classroom taking little time away from other literacy instruction (Volpe et al., 2011).

Other formats for teaching functional as well as core curriculum sight words including direct massed trial instruction in a resource room, direct distributed trial instruction in the general education classroom, and embedded distributed trial instruction in the general education classroom using a CTD procedure has been conducted. Students receiving the embedded instruction performed the same activities as their peers without disabilities. The participants in this study included students with moderate to severe cognitive disabilities in elementary, middle,

and secondary schools. The findings indicated that each participant met criterion for acquisition for both functional and curriculum sight word instruction but found no real significant difference across formats suggesting that educators have options for delivering sight word instruction for this population in both special and general education settings using a systematic instructional procedure such as CTD (Collins, Evans, Creech-Galloway, Karl, & Miller, 2007).

Another study and one specific to the research focus for this dissertation demonstrates the effectiveness for teaching functional sight words to students with significant disabilities was conducted by Swain, Lane, and Gast (2015). In this study, Swain et al., compared the effects for teaching functional sight word to students with intellectual disabilities and autism. This study was chosen for replication because of the following components: participants were diagnosed with intellectual disabilities and autism, use of a constant time delay procedure, and its methodological soundness based on the study's inclusion of Horner et al., (2005) quality indicators for time delay studies. The authors documented their inclusion of these essential indicators: participant and setting description, full dependent variable description, full independent variable description, baseline measurements, experimental control, and validity (Browder et al., 2009; Horner et al., 2005).

The authors chose four students from 8-11 years of age with intellectual disabilities (ID) or with a dual diagnosis of moderate ID and autism spectrum disorder (ASD). Their inclusion criteria included the following elements: diagnosis of moderate ID or ASD with comorbid moderate ID, received services in the self-contained classroom at least part of the day, and absent less than 10% of the school days in the last two months. In addition, the students were screened to ensure that they could imitate a verbal model, wait at least 5 seconds for a prompt, and sit and attend to stimuli for at least five minutes. Student records were reviewed to document

prerequisite skills. The students had been exposed to CTD but not SP. The teacher had experience with both. One student was male, and the other three were female.

The sessions were one-on-one and held in the self-contained classroom of the public school setting. One session was held at McDonalds for a generalization assessment. Parents were asked to identify 25 sight words from the Edmark: Fast Foods and Restaurant list. The words were written on index cards to use during the instructional sessions but used handheld menus that contained sight words from the study for generalization sessions. The dependent measures were used to compare CTD and SP and consisted of the number of sessions through criterion, number and percentage of errors through criterion, minutes of instructional time through criterion, and number of trials through criterion. The authors used other measures including unprompted correct responding, prompted correct responding, unprompted incorrect, prompted incorrect, and no response.

The experimental design used was adapted alternating treatments design (AATD) across two comparison conditions and replicated across for participants. The authors stated purpose was to compare CTD and SP for efficiency in teaching students with moderate ID or with a dual diagnosis of autism and moderate ID functional sight words. General procedures included two sessions daily using each time delay procedure but no more than two consecutive sessions with the same procedure. Comparisons of CTD and SP with three target words per procedure per comparison were made. A total of 12 sight words were used for each participant. Students selected their own reinforcer from two choices, and these were delivered at the end of each instructional session and not based on performance. For baseline, the teacher presented each target word two times for a total of 24 trials during probe sessions. The teacher used 5-second

time delay for response, and a 3-second inter-trial interval. Review trials, a generalization phase and three maintenance phases were implemented.

The review trials were used to provide continued practice for mastered word sets. The authors used three maintenance sessions after instructional sessions to assess each student's ability to read the targeted sight words. The review trials were not included in data reporting.

For generalization, he authors used the second word set for each participant. Words were presented twice with a total of 24 trials. The first generalization session was conducted in the classroom after maintenance, and the procedures were identical to screening procedures. The second generalization occurred at McDonalds using a menu that contained the targeted sight words from the second word set. For reliability, the authors used trained observers who collected inter observer agreement (IOA) and procedural fidelity for 20% of sessions across conditions.

The findings were that both procedures were effective for teaching functional sight words to students with ID or ASD in a self-contained classroom. Findings indicated that CTD was more efficient for two students on sessions through criterion. Also, the authors reported that CTD was more efficient with number and percent of errors through criterion for all four participants. They also reported that SP was more efficient for one student with a difference of one session but equal for the other student. In addition, finding indicated that SP was more efficient for training time through criterion; however, differences were said to be minimal. Finally, trials through criterion were lower for CTD for two students, equal for one, and lower with SP for one. For generalization results: students were able to generalize recognition of the targeted sight words to the classroom using a local menu with 66-100% accuracy, and generalized using a menu from McDonalds 60-100%. Stated limitations included the lack of pre-intervention student data to increase external validity and prescribing generalization to only one set of target words as well as

to a pre-post-test, and this limited internal validity, and therefore, no functional relationship could be made for a single case design. And finally, students had been exposed to CTD but not SP, and it could not be known how this may have affected the results.

Based on the implications as well as the limitations from this study, I propose to study students with ID and/or students with a dual diagnosis of moderate ID and autism spectrum disorder with IQs in the 45-60 range as documented by recent intelligence testing. However, for this study CTD will be the only independent variable for testing its effectiveness for teaching students with ID to recognize and generalize functional sight words. Swain et al., (2015) found that both CTD and SP were effective for teaching functional sight words to the students but that CTD was more efficient with number and percent of errors through criterion across all students, CTD was more efficient for sessions through criterion for two participants and equal for one with SP being more efficient for one participant but only with a difference of one session, and CTD was more efficient (lower)for trials though criterion for two participants, equal for one with SP being lower for one participant (Swain et al., 2015).

Swain et al. (2015) reported mixed results from previous studies. Four previous studies found from a review of CTD and SP comparisons including Kurt and Tekin-Iftar (2008), Head et al., (2011), Risen et al., (2003), Schuster et al., (1992), and Tekin and Kircaali-Iftar (2002) indicated that both procedures were effective for teaching discrete skills (sight words) but efficiency measures documented that CTD was more effective for some while SP was for others. One critical concern was the use of daily probes to equalize the two procedure comparisons. When using CTD, probes are unnecessary because the student has an opportunity to respond before the controlling prompt and before allowing the measurement of transfer of stimulus control. On the other hand, SP requires an additional daily probe because the nature of the

procedure does not allow for measurement of the transfer of stimulus control. Swain et al., (2015) argued that in the previous studies CTD was altered by adding daily probe sessions to measure effectiveness and efficiency when comparing the two procedures. The authors further stated that the previous studies lacked fairness when comparing efficiency measures. They suggested that the added daily probe sessions allowed for potential bias.

Additionally, Walker (2008) studied reviews of comparisons for two-time delay responses including CTD and PTD for implementation with students with Autism Spectrum Disorder (ASD). She stated that findings suggested that both of these procedures were effective for teaching students with (ASD) and also stated that the interventions were effective across settings, instructional arrangements, and with various instructors no matter what their age, gender, or cognitive functioning were. The author stated that all behaviors learned were maintained and generalized. Furthermore, findings suggested that CTD was more efficient than system of least prompts (SLP) and that PTD was more efficient than SLP and least to most prompts (LTM).

The purpose for this study is to add to this evidence base for teaching recognition of functional sight words to students with significant disabilities and addressing limitations of the Swain et al. (2015) study by adhering closely to Horner et al. (2005) quality indicators assigned to designing a single-subject study for time delay procedures. Therefore, the study will seek to determine the effectiveness for a time delay procedure to focus on the efficiency and effectiveness without the concern of introducing bias because of the differences inherent in two different procedures. Also, the use of only one procedure creates less confusion for students, teachers, and researchers. In addition, CTD results in less frustration for students with significant disabilities because the procedures allow for them to wait for the prompt if they do not know the

target word. Also, Swain et al. stated that CTD required 48 less trials for two participants to reach mastery regarding trials through criterion. Measures for sessions (CTD-47; SP-50) and time (CTD-24.32 min and SP-22.11 min) through criterion were minimal, however, the authors argued that the three less sessions required for CTD could be used to teach more sight words with less errors. Finally, CTD is reported to be simple to use, easy to understand, and less cumbersome (Swain et al., 2015, Walker, 2008).

Results from the present study can add to the findings from Swain et al. (2015) regarding the CTD results as well as increase the evidence base for teaching students with moderate ID and students with a dual diagnosis of moderate ID and autism in a transition setting. These results are needed to increase the choice of evidence-based procedures for working with students who have very specific characteristics and needs. Furthermore, these results will document the effectiveness for using CTD to increase independence for students with significant disabilities increasing their opportunities to access community resources as well as improve their quality of life.

One constant in time delay studies was the authors' suggestions that future research clarify the characteristics of the participants completely as well as provide a detailed descriptions of the intervention components. Authors suggested that knowing the student profiles can help understand the degree to which the specific interventions are effective and inform teachers of which intervention is likely to have the greatest impact for a particular student (Coleman et al., 2015; Swain et al., 2015; Walker 2008). This study will include more clarity in participant description which Swain et al. (2015) achieved.

Furthermore, providing an accurate description of the intervention is essential for later comparisons. For example, response latency can be confused with time delay. Latency is the wait

time the teacher provides before delivering the prompt or corrections. For time delay, there must be 0-second delays as well as delayed prompts after initial trials. Research suggested that it is imperative to provide a clear definition of the intervention's components and practices so that the procedure can be understood by other researchers and practitioners for accurate replication and implementations, both empirically and practically. It is the aspiration for this study to clearly identify the intervention as well as the participant characteristics to develop more fully the evidence-base for teaching students with significant disabilities (Browder et al., 2009; Cook & Odom, 2013). Additionally, providing further support for the effectiveness of CTD for teaching functional sight words to students with significant disabilities can lend support for using this procedure to teach other critical reading skills. The following section describes the research base for supporting student learning in higher reading processes.

Phonics, Fluency, and Comprehension Instruction

Research suggested that students with significant cognitive disabilities not only benefit from systematic instruction in sight words but also in phonics, decoding, fluency, and comprehension. In many instances, the same procedures for sight word instruction including time delay and prompting can be modified to teach more intensive literacy skills (Allor, Champlin et al., 2010; Allor, Mathes et al., 2010; Cohen et al., 2008; Joseph & Seery, 2004; Waugh et al., 2009). A literature review found that students with significant disabilities can benefit from instruction in phonics analysis (Joseph & Seery, 2004). A three-step decoding intervention with constant time delay has demonstrated effect for students with significant disabilities. The three steps studied included attaining the student's attention, word decoding, and word reading. The authors reported that all students reached criteria using the three step intervention with CTD and exhibited increased word reading efficiency in following sessions (Cohen et al., 2008).

Accordingly, simultaneous prompting can be used to teach letter sound and decoding skills to students with significant disabilities. This allowed students to identify letter sounds and blend the sounds to make words based on previous instructional words. In addition, the authors stated that the students were able to transfer this knowledge to the reading of new words (Waugh et al., 2009).

Comprehensive reading instruction focused on the teaching of individual words and connected text to provide students with disabilities greater access to literacy (Alberto et al., 2013). A study providing a sight word component as part of a curriculum package, the Integrated Literacy Curriculum (ILC), comprising sets of controlled and functional vocabulary demonstrated success for students with significant cognitive disabilities (Alberto et al., 2013). The ILC, however, is a complete literacy program including not only sight words but also a visual literacy and a phonics component. This was a longitudinal study with findings corroborating other research that stated that students with significant disabilities need more time to acquire, maintain, and generalize new information (Browder et al., 2006; Allor, Champlin et al., 2010; Allor, Mathes et al., 2010).

The unique focus of this study included the criteria for selecting sight words. Instructional words had to lead to comprehension of words in connected texts, not just comprehension demonstrated by students matching picture to word. Words selected for instruction consisted of words encountered frequently in the environment and words that are functional, reducing the amount of memory needed and providing for generalizing. Connected text, for this study, consisted of at least two words and carried a message that could be understood including a variety of parts of speech allowing for many samples of phrases to be created. Students were taught nouns, adjectives, verbs, articles, and prepositions. Mastery of each

set of words related to a specific part of speech was determined before moving to the next set of words for another part of speech. Once words were mastered for two parts of speech, the words were combined to make a phrase. For example, once nouns and adjectives were mastered, they were combined to determine the student's ability to read the connected text.

After students exhibited mastery, other parts of speech were interspersed such as action verbs to allow for phrases that required students to make an appropriate response. During the controlled Vocabulary Strand, students demonstrated generalization of words and phrases read by reading words in different contexts and by matching words and phrases to corresponding pictures. During the functional strand, students demonstrated generalization by reading words that had been learned individually but then put in phrases and in natural settings. For example, students reading out of order on a vending machine and providing the appropriate response of moving to another machine. Students need to read words in context to become efficient readers and access their environment through environmental print and leisure activities including the ability to read for pleasure allowing them to gain critical information to function in and enjoy their environment (Alberto et al., 2013).

This instructional design allowed students to move from word study to phonics instruction. Teachers monitored student progress, and if students were not successful at the phonics level, the teacher had the option of moving students through a sight word instructional approach involving a three-step systematic approach. The instructional intervention used for teaching the sight words was simultaneous prompting allowing for the instructional cue and the controlling prompt to be issued at the same time. This intervention is utilized to create a near-errorless response. The findings of this study suggested that the sight word component of the ILC can be an effective teaching intervention providing an opportunity for students with significant

disabilities to make gains in reading words and connected text in the classroom and in their environment.

The study further supported the use of simultaneous prompting over constant time delay for teaching. Simultaneous prompting requires fewer student responses, less teacher decisions and less difficulty in implementation (Alberto et al., 2013). In addition, the ILC is the only program that focuses on teaching functional text and requiring a demonstration of comprehension each time words or phrases are read to students (Alberto et al, 2013.). Furthermore, the study provided evidence that students with significant disabilities can learn not only to read but to complete tasks based on words and phrases read. The study also provided a functional outcome for teaching reading to this population.

The phonics portion of the ILC program included Initial Phonics and Functional Phonics designed to move students from learning beginning phonics skills to reading words and phrases. The phonics portion was used as an intervention with five students with moderate intellectual disabilities between ages of seven and fourteen with IQ scores between 40 and 55. Simultaneous prompting was used to teach sounds, letter-sound correspondence, and blending. The study found simultaneous prompting to be effective for teaching these students word-analysis skills including imitation of sounds, letter-sound correspondence to automaticity, blending, telescoping, and generalizing blending skills to new words and phrases (Fredrick, Davis, Alberto, & Waugh, 2013).

Other methods included text-based applications that have been found to increase student ability to transfer (apply what is taught in one situation to a new context) skill instruction to reading by utilizing words quickly in text (Allor, Gifford, Otaiba, Miller, & Cheatham, 2013). One study proposed to provide alternative interventions to support reading for students with

significant cognitive disabilities. Their study utilized direct instruction to provide instruction for three students with IQs in the range of 45 to 59 who had not been successful with previous systematic reading instruction. The intervention consisted of storybook and text application lessons that provided foundation skills needed to read the words in the storybooks.

The authors found that the intervention was effective for producing improved word reading ability; however, they admitted that the student's assessment scores showed little overall growth. Equally important, the research indicated the need for additional time along with repetition and systematic instruction for students with significant disabilities to learn new information. The authors admitted that this intense, individualized instruction is extremely time-consuming but worth the investment for students with cognitive disabilities (Allor, Gifford et al., 2013; Fredrick et al., 2013).

As students gain functional word and sight work recognition as well as motivation to strive for greater literacy skills, practitioners should consider providing instruction in other reading components. Another program developed to teach literacy skills to young students with significant cognitive disabilities demonstrated promise for this population gaining phonemic awareness and phonic skills. These skills may enable them to decode and comprehended text. The Early Literacy Skills Builder was designed to teach reading skills to young students with cognitive disabilities. The curriculum was developed based on reviews of research on early literacy programs, and assessments. The objectives of the program included: early literacy skills, direct instruction, reading, and augmentative communication for a variety of skill levels. These objectives were developed into a scope and sequence that began with sight word interventions using a CTD procedure graduating from a 0-second delay to a 5-second delay and a system of least prompts (Browder, Ahlgrim-Delzell, Courtade, Gibbs, & Flowers, 2008).

The study included 23 students in grades kindergarten through fourth grade with average IQs of 41 with a range from approximately 20 to 54. Skills taught included sight word vocabulary, pointing to sight words in sentences, pointing to words as teacher reads them, pointing or saying words to complete sentences, responding to questions about story, clapping syllables, tapping phonemes, identifying letter-sounds correspondence, identifying and finding first and last sounds in words, pointing to letters from segmented words, pointing to pictures that represent segmented words, and pointing to pictures of spoken words (Browder et al., 2008). Positive outcomes were found for students who received instruction in this curriculum over students who did not. Researchers believe that these results provided support for higher literacy skills for this population. The authors admitted that further research is needed to determine if these gains translate into fluent reading for these students.

Furthermore, it is important that literacy instruction start early and continues for longer periods of time. However, the authors warned that the intense nature of these skills may hinder progress for these students at an early age as noted by Browder et al., 2008. In contrast, Mirenda (2003) warned educators that students with disabilities are not always capable of exhibiting all the skills they possess and may need forms of augmentative communication to support their learning but must not be considered as incapable of learning to read and should be provided literacy instruction from an early age.

Literacy instruction for students with developmental and intellectual disabilities may be enhanced by augmenting the reading instruction with a sign language component, based on individual need, across instructional elements including concepts of print, phonemic awareness, sight word recognition, vocabulary, and comprehension (Beecher & Childre, 2012). Sign language can serve as a visual prompt and can be implemented across all settings and with

different individuals. Research indicated that students with cognitive disabilities can master basic literacy skills when sign language is added to the reading program providing students with alternative visual representation and another method for accessing new information. Students demonstrated gains in letter identification, letter sound correspondence, sight word knowledge, receptive vocabulary, and listening comprehension. Further, a sight word curriculum served as the foundations for this intervention. More importantly, this research highlighted the importance of designing and implementing supplemental instruction in addition to the district-mandated curriculum to benefit students with significant cognitive needs (Beecher & Childre, 2012; Allor, Champlin et al., 2010).

Other programs shown to be effective for students with significant cognitive disabilities include Corrective Reading Programs that are a direct instruction based intervention designed to teach reading skills to older students who have not mastered basic literacy skills including decoding skills. Three males between the ages of 12 and 15 with moderate intellectual disability were provided with the Corrective Reading Program, Decoding A (Bradford, Shippen, Alberto, Houchins, & Flores, 2006). These students gained skills in letter sound correspondence, sounding out words, blending to read words, decoding irregular words, reading sentences and short passages.

In addition, the research with this population extended the use of the Corrective Reading Program for students at this functioning level. The authors of this study pointed out that these students were able to transfer these decoding skills to reading of functional words. Additionally, struggling readers who were provided with a Syllable Skills Instruction Curriculum (SSIC) in addition to the direct instruction curriculum, the Corrective Reading Decoding Program, gained skills in word identification, word attack, and reading comprehension (Diliberto, Beattie,

Flowers, & Algozzine, 2009). The Syllable Skills Instruction Curriculum provided instruction in chunking words, syllable instruction vocabulary, syllable patterns, and syllabication rules. These findings suggested the importance of teaching decoding skills on multisyllabic words using explicit instruction (Diliberto et al., 2009).

Teaching phonics skills to students with significant disabilities is gaining attention and needs to be further explored to provide appropriate reading instruction and not limit potential reading gains for this population (Browder, Xin, 1998; Lemons, Mrachko, & Kostewicz, 2012). Students with significant cognitive disabilities have exhibited success in the reading of phonetically regular words when the exact words and letters were used for instruction in the intervention. One study (Lemons et al., 2012) used two evidence-based interventions, Road to Reading (RTR) and Road to the Code (RTC). The interventions comprised critical literacy components for phonemic awareness and phonics.

In this study, the authors wanted to investigate the effectiveness of interventions to specifically increase early reading skills of phonics, letter-sound correspondence, sight word recognition, phonetically-regular words, and oral reading fluency. The RTR intervention included instruction for teaching the alphabetic principle (teaching reading phonetically) in order to potentially develop student comprehension skills. The RTC intervention taught eight letter sounds using games to help students match letters to appropriate sounds, categorize, rhyme, blend, segment, and spell simple consonant-vowel-consonant words.

The authors described the RTR results as moderately effective for teaching word reading of words actually taught during intervention instructional sessions but found no gains in oral reading fluency. In addition, the authors found little evidence that the RTC intervention improved student ability to identify letter-sound correspondence or initial sound, segment, or

blend. The authors confirmed gains in student reading of only taught words and sounds; however, students were not able to generalize nor able to transfer their learning to other words or to gains in reading fluency (Lemons et al., 2012). Furthermore, the authors admitted that the length for this study (approximately 12 weeks) may have limited the success of the interventions for students with cognitive disabilities as studies have substantiated that students may need from 15-20 weeks to a year to make progress in near-transfer and generalization skills, documented by Allor, Champlin et al. (2010) and Allor, Mathes et al. (2010). In addition, instruction must be individualized for each student focusing on memory, application, mastery, language, and behavioral needs and must include participation of educators, researchers, and coaches to allow for student success in reading (Allor, Mathes et al., 2010).

Students with cognitive disabilities also need to have the opportunities to learn literacy components including fluency and comprehension in addition to sight word and phonics instruction. As sight word instruction has been the traditional method for teaching students with significant disabilities, research in these areas is limited for this population. Browder et al. (2006) in their review of reading instruction for students with disabilities found that more than two thirds of the studies focused on teaching sight words. They found some studies focusing on phonics, fluency, and comprehension; however, the authors confirmed that these studies did not include essential evidence-based practices to allow for implementation of these reading components with this population.

Additionally, the authors of one study investigated the use of a technology-based universal design intervention called Literacy by Design (LBD) with 16 students in grades kindergarten through second grade identified with significant cognitive disabilities (Coyne, Pisha, Dalton, Zaph, & Smith, 2012). They pointed out that the intervention addressed all five

areas of teaching literacy including phonemic awareness, phonics, comprehension, fluency, and vocabulary. The intervention included digital storybooks that primarily focused on scaffolding comprehension but also included instruction for the other reading components. In addition, software programs supplemented the LBD intervention by providing exercises and games that addressed all five core reading components. The authors stated that the LBD intervention resulted in the students making notably greater gains in comprehension than the control group and indicated strong effect for word attack skills, listening comprehension, and print concepts. Additionally, the authors stated that the results of this study along with other studies supported the potential learning for students with significant cognitive disabilities when provided with appropriate evidence-based instructional interventions (Coyne et al., 2012; Browder et al., 2008).

Accordingly, another study (Wanzek & Roberts, 2012) investigated the varying effects of three intervention conditions for 87 students in the fourth grade identified as having reading difficulties, all below the 25th percentile in reading comprehension, word recognition, and word attack. Students were assigned to one of four intervention conditions through stratified random assignment. The four conditions included: word recognition emphasis, comprehension emphasis, responsive emphasis, and comparison. The word recognition emphasis provided instruction in word reading and application. The comprehension emphasis provided instruction in comprehension skills and strategies. The Responsive emphasis provided instruction based on student needs, and students were placed in groups accordingly. The comparison group continued to receive the school interventions including decoding, vocabulary development, selecting main idea, and finding information embedded in texts. Interestingly, the authors found no reliable differences among interventions provided in this study. Furthermore, students in the comparison group performed similar to those receiving the research based, school interventions. The authors

did admit that the existing school interventions were strong because they were using research-based strategies (Wanzek & Roberts, 2012).

Intensive Instructional Needs

In addition to finding the appropriate intervention and method, research continually pointed out the need for additional time for students who struggle to gain literacy skills; however, frequency, duration, and intensity alone do not appear to address the needs of students with significant cognitive disabilities (Allor, Champlin et al., 2010; Allor, Mathes, 2010). In another study, students who were considered low-responders as indicated by their below benchmark scores were assigned to one of two formats. One format (Wanzek & Vaughn, 2008) provided a 25-minute daily intervention while the second format provided a 50-minute intervention. The interventions were applied daily with format one receiving approximately 25 hours of intervention and format two receiving approximately 50 hours of intervention. The studies involved students who were in first grade and from high-poverty, Title 1 schools. The students received instruction in phonics, word recognition, fluency, and passage reading. Findings demonstrated little reading progress with scores well below benchmark for the end-of-the-year. The authors of this study suggested that students who are low-responders will continue to need intense interventions and different instruction that is specialized for individual needs. The authors continued stating that individual needs will change and instructional emphases will need to be flexible (Wanzek & Vaughn, 2008).

Furthermore, research indicates that it is important to consider a student's IQ when designing reading interventions. Student with lower IQs (40-55) can take as long as three and half years to move from 0 to 20 words per minute and those with higher IQs (75) may need only 52 weeks of intervention to increase from 20 to 60 words per minute. Research also points out

that achievement for students with significant disabilities can be related to other variables other than IQ and indicated that some students within lower IQ ranges actually make more progress than students in higher ranges (Allor et al., 2014). Students with significant disabilities need many repetitive, consistent, and explicit opportunities to respond to instruction and this instruction may need to be carried out for years. However, students with disabilities can make literacy gains (see Table 1).

Table 1

Intervention Time Needed to Increase Words per Minute (wpm) Correlated to Student IQs

Student IQ	Instructional Time for Intervention Needed	Number of WPM Increase
IQ of 75 (borderline range)	52 weeks of intervention	To move from 20-60 wpm
IQ between 70-80	One and one-half school years	To move from 20-60 wpm (Basic ending rate for end of first grade)
IQ between 59-69	Three academic years	To move from 10-60 wpm
IQ between 40-55 (moderate range)	Three and one-half years	To move from 0-20wpm

Note. Adapted from "Is Scientifically Based Reading Instruction Effective for Students with Below-Average IQs," by J. H. Allor, P. G. Mathes, J. K. Roberts, J. P. Cheatham, and S. A. Otaiba, 2014, *Exceptional Children, 8,* p. 302. Copyright 2014 by the Council for Exceptional Children.

Moreover, intensive instruction has been documented to affect brain activity during oral reading at the word level including phonological and decoding skills producing significant neurophysiological changes. Changes in brain activity were documented in students who struggled to progress in reading skills even after appropriate classroom and intervention instruction (Simos et al., 2007). The authors studying these changes suggested that further studies need to investigate interventions in terms of intensity, duration, and content to determine

which instructional strategies will produce long-lasting changes in brain activation profiles that will further result in significant, lasting reading improvement.

Summary

As stated, this study sought to answer questions relevant to student characteristics, interventions type, and contexts to determine if a functional sight word CTD intervention was effective for increasing the number words the participants could master. Throughout the literature review numerous interventions and procedures were discussed to provide understanding of the evidence-base for teaching students with significant disabilities. Scarcity of research to address the varied needs of student with significant disabilities especially those with intellectual disability and autism was also discussed. One procedure that has proven effectiveness is CTD. However, research indicated that more studies need to be implemented for students with different characteristics to better determine what works best for each individual.

Results from the present study sought to extend the findings from Swain et al. (2015) and address future research needs including providing more clarity of student characteristics allowing researchers and practitioners a better understanding of the effectiveness of the CTD procedure for working with this specific population (Coleman et al., 2015; Swain et al., 2015; Walker 2008).

CHAPTER III:

METHODOLOGY

This chapter focuses on the research methods used in this study. Specifically, the chapter describes the research design, research procedures, participants, setting, instrumentation, and data analysis as well as the assumptions and the limitations of the study. Therefore, the purpose of this study is to determine what effects a sight word intervention will have on the development of foundational literacy skills for students with significant disabilities. Specifically,

1. Does constant time delay used when teaching functional sight words increase student's word recognition as measured in words read correctly at intervention; and
2. Do teachers and students find the use of the CTD procedure for teaching and learning functional sight words appropriate and effective as measured by the Teacher Evaluation Inventory Short Form (TEI-SF) 5-point Likert scale?

As stated, the goal for this research was to measure the effectiveness for utilizing CTD as an intervention for teaching the recognition of functional sight words to transition-age students with significant intellectual disabilities enrolled in a model postsecondary transition program located on a large university campus in the Southern United States. The intent was to provide participating students a repertoire of functional words that each participant could recognize automatically and be able to not only read the words in a classroom setting but be able to generalize the words to other written forms.

This present study sought to add to the findings from studies such as Swain et al. (2015) regarding the use of time delay interventions to support students' recognitions of functional sight words as well as to increase the evidence-base for teaching students with significant ID in a transition setting. Results from these and other studies focused on using a constant time delay intervention are needed to increase the choice of evidence-based procedures for working with students who have very specific characteristics.

One recommendation in time delay studies was the authors' suggestions that future research should clarify the characteristics of the participants completely as well as provide a detailed description of the intervention components. As noted earlier, knowing the student profiles can help understand the degree to which the specific interventions are effective and inform teachers of which intervention is likely to have the greatest impact for a particular student (Coleman et al., 2015; Swain et al., 2015; Walker 2008). Utilizing the Swain et al. (2015) recommendations for future research, the researcher provided in-depth participant descriptions as well as conducted generalization probes of the target words in two different probes. One probe consisted of the 10 functional sight words being typed into a word document, and the other probe utilized a grocery app for the phone where the words were integrated into a shopping list. Neither of these two features were included in Swain et al. (2015) study. Another difference from the Swain et al., 2015 study was that this present study allowed the students to participate in choosing which component of the functional sight word program, *Edmark Reading Program*, (Bruni & Hixson, 2017) he or she wanted to learn and which 10 sight words he or she would like to work on. This provided opportunities for choice-making; an essential skill in reaching the self-advocacy goal in a transition program that is designed around a student's interest and building independence.

As stated in Chapter II, students with significant intellectual disabilities have not received adequate focus in the development of interventions related to literacy. In this study, a constant time delay (CTD) procedure was used to teach functional sight words to students with significant intellectual disabilities. The words were carefully selected from the *Edmark Reading Program* based on individual student's needs, preferences and interest and taking into account reading skills (IDEA, 2004). This study was guided by the following research questions:

1. Does constant time delay used when teaching functional sight words increase student's word recognition as measured in words read correctly at intervention; and
2. Do teachers and students find the use of the CTD procedure for teaching and learning functional sight words appropriate and effective?

Research Design

This study utilized a single-subject research with a concurrent multiple baseline design including a baseline and intervention phase with generalization and maintenance (Kazdin 2011). Single subject research is especially well suited for special education as this methodology can address concerns at the individual level when one is seeking to determine causal or functional relationships between variables (Kaszdin, 2011). In addition, single-subject allows for within and between-group comparisons situated in complex situated environments (Horner et al., 2005). Furthermore, this methodology comprises features that provide quality indicators that can be used to determine if an intervention is evidence-based. Specifically, for special education, a single-subject design can provide accurate analysis of effects taking into account intervention introduction and manipulation. Single-subject is especially useful in understanding the outcomes

for a particular individual under certain conditions, which is the central focus for special education research (Horner et al., 2005).

For this study, the researcher measured students' ability to master functional sight words using a CTD intervention. A concurrent multiple-baseline design was used to implement baseline and intervention. A multiple baseline across individuals was well suited for this research study as the design was intended to determine if there was a behavior (word reading) change across individuals once the (CTD) intervention was applied. Furthermore, no reversal of behaviors and no experimental conditions were needed to document behavior change.

Participants were being taught the 10 target sight words using a CTD intervention, and the intent was that they would master the words but would not return to the baseline data points because they would not unlearn the words. Therefore, no reversal to baseline was needed as characteristic of ABAB designs (Kazdin, 2011). More importantly, multiple baseline allowed for comparisons across individual participants throughout all phases of this study including baseline, intervention, generalization, and maintenance. Multiple baseline evaluation can demonstrate that the behavior change was only evident when the intervention was applied and not before and can show that competing arguments are unlikely. For multiple baseline, visual inspection in the form of a graph demonstrates the intervention effect in terms of participant behaviors represented by mean, level, trend (slope), and latency (explained more fully in the data analysis section).

This design was appropriate to demonstrate whether or not an intervention produced potent effects for each participant's performance level in recognizing functional sight words. Two researcher determinations were made: (1) How would the participants be ordered for entering intervention? and (2) What would be the rule for moving participants into intervention? The decision was made to move the participants into intervention based on their individual

baseline data points. After three data points of baseline, visual analysis would allow the researcher to determine slope and trend of the baselines. The participant with the stable baseline across data points but with the highest number of target words recognized before intervention would be moved into the intervention phase. Once the first participant entered the intervention phase and established a stable baseline with trend and slope across at least three data points, the researcher would decide the next participant based on visual analysis of the baseline data. The researcher would follow the same visual analysis for slope and trend across three data points for remaining three participants. If no one participant demonstrated any change in slope and trend across three data points, then the researcher would randomly select the next participant to enter intervention. Once a participant entered intervention, the researcher would analyze the data to determine if the participant had established a stable pattern for slope and trend across at least three data points. When a stabilized pattern of increasing functional sight word recognition across at least three data points with stable slope and trend emerged, the researcher would invoke the intervention for the next participant and for each participant after that. This design works for a small group or a few students receiving an intervention that can be introduced sequentially (Kazdin, 2011) and fits the design need for the CTD intervention with four participants.

Applying the intervention after baseline for one participant at a time as in this multiple baseline design would allow the researcher to visually analyze the data for scope, trend, latency, and mean. Additionally, the design would decrease the opportunity for external variables to interfere with potential results. Once the participant receives the intervention and there is an immediate change in the behavior being measured (word reading), there is little doubt what is causing the increase (Kazdin 2011). For the CTD intervention, the multiple baselines would be the number of participants (Kazdin, 2011). Because the CTD was the only intervention being

used to teach participants with significant intellectual disabilities to recognize functional sight words, multiple baseline across individuals was chosen as it is specifically designed to determine a single behavior change across individuals. Additionally, the intervention can be invoked for one individual at a time (Kazdin, 2011). Therefore, multiple baseline was chosen over changing-criterion and multiple-treatment designs. Changing criterion addresses interventions meant to result in gradual change in behaviors, and multiple-treatment designs are meant to determine the results for two or more interventions in the same phase leaving multiple baseline as the best suited design for this study (Kazdin, 2011).

Participants

Students with significant intellectual disabilities who attended a transition program on a college campus in the southeastern United States were the participants for this study. Each student attended the campus' Summer Bridge program providing educational and transition experiences on the university campus that created opportunities for students to learn daily living, academics, social skills, and employment all while living in the university dormitories. Students with significant intellectual disabilities having IQs between 45 and 60 based on the participant's most recent scores were chosen for participation in this research study. Each was identified with an intellectual disability. Their selection was based on the following criteria: (a) a student in the university Summer Bridge transition program; (b) a diagnosis of an intellectual disability; (c) having a reported IQ between 45 and 60; (d) an inability to recognize functional sight words; (e) communicating a desire to learn functional sight words; (f) communicating a desire to independently order their own food, recognize and understand job-related words, and/or select and purchase their own food at a grocery store; and (g) referred by the coordinator of the program based on their knowledge of the students' interest and abilities. Exclusionary criteria

included the following: (a) students who do not wish to learn functional sight words; (b) students whose parents do not give consent; (c) students who would be negatively impacted by generalization activities; and (d) students whose needs do not match the intervention.

Four students who met the eligibility requirements were asked to participate in the study. Parent letters were sent home to the parents of these four students to obtain parental consent for participation in the study. Once this consent was received, participants had an opportunity to give verbal assent as to whether or not they would like to participate.

The participants communicated a desire to read based on their interest inventory sessions. The three inventory instruments included in the Appendices: student Dream Sheets, a Qualtrics questionnaire designed for students attending Summer Bridge, asking students to answer questions regarding their desires for the future including daily living, social, and academic proclivities; a Living Skills Checklist from *Transdisciplinary Vocational Assessment: Issues in School-Based Programs* that measures student competencies in daily living, academics, mobility, and social skills; and a Reading inventory from *Accommodations: Accommodating Adults with Disabilities in Adult Education Programs* that provides information on individual student perceptions of their own reading ability and desires. These inventories confirmed the students desire to learn functional sight words as well as to develop reading skills.

The participants' ability to recognize functional sight words was determined by each student's ability to read words from a list of commonly known words taken from the Dolch word lists (levels one through three). The researcher chose 20 random words from each of the three lists and created a probe to assess student's ability to read the words. This assessment provided the researcher with data as to whether or not the student had sufficient word recognition ability and whether or not the student could benefit from the proposed intervention. If the student

identified less than 40% of the words, he or she met the requirement for not knowing functional sight words. For one student, who struggled to read the 40% of the Dolch sight words but was able to meet the 40%, another word probe, the Fry word list, was given because it assessed word recognition beyond third grade. Dolch sight word lists and Fry word list and phrases are leveled list that included the majority of words read in text. This was provided to allow this student access to the intervention because the student is over 30 and has expressed a desire to read. Once given the Fry list, the student failed to recognize 40% of the words. The words comprising both the Dolch and Fry word lists make up a large part of daily reading text. The probe lists can be found in the appendix.

Table 2

Participants

Participants	Gender	Age	IQ
Hannah	Female	30	56
Mandy	Female	25	52
Thomas	Male	21	41
Steven	Male	21	47

Steven is Caucasian male. He was the youngest student and had just graduated in May from the campus transition program. He had only attended the campus program for one year and entered the program after leaving his local high school. Steven's latest eligibility testing indicated that he scored a 51 in conceptual, 61 in social, and 40 in practical adaptive skills. Steven scored a 40 on listening comprehension and a 40 on oral expression on the Oral and Written Language Scales (OWLS-2) evaluation. Steven scored a 40 on letter word recognition, a 40 on reading comprehension, and a 46 on total reading on the Kaufman Test of educational

achievement. He scored a 56 on verbal comprehension, and a 54 on nonverbal comprehension. Steven's total intelligence score was a standard score of 47. He was not able to recognize any sight words from the pre-assessment probe nor was he able to identify all pictures of common objects.

The other male student was Thomas, a Caucasian male. Like Steven, Thomas had recently completed his high school program. His scores on the Wechsler Nonverbal Scale of Ability indicated that he attained a full scale of 41, and the Wechsler Individual Achievement Test indicated that he achieved a 40 composite standard score with a 41 in reading, a 40 in math, a 40 in written language, and a 40 in oral language. His adaptive behavior scores as recorded for the Adaptive Behavior Assessment System indicated that Thomas received a 53 on conceptual, 70 on social, and a 51 on practical language skills. His OWLS scores indicated that Thomas scored a 40 on listening comprehension and oral expression. Thomas was able to identify approximately 20% of the basic Dolch words as well as recognize some of the pictures of common objects. The two female participants were Mandy and Hannah.

Mandy, an Asian female, was 25 at the time of the study and had completed her local high school program when she was 21. Her eligibility assessments were not up to date but indicated that her total standard score for the Wechsler Nonverbal Scale of Ability indicate a 52 full scale score. Mandy recognized approximately 35% of the Dolch sight words. She did have some difficulty articulating some of her responses. More in-depth details of formal testing were not available due to her age.

Hannah, a Caucasian female, was 30 at the time of this study and had completed the campus transition program 2008. Her eligibility assessments indicated that according to the Wechsler Nonverbal Scale of Ability, her full-scale score was 56. Hannah was able to recognize

approximately 32 % of the basic sight words. Because of her age, more in-depth details of her functioning level were not available. However, based on verbal and non-verbal work samples, she had difficulty processing her answers but was able to solve and respond appropriately when given time.

Setting

The setting included a dorm on the university campus where students attended the Summer Bridge transition program for students with intellectual disabilities. This program is designed to provide transition students with inclusive experiences including attending college classes, living in dormitories, working at local job sites, and socializing with other students with and without disabilities. The dorms were the same residential setting that students without disabilities were assigned. Students without disabilities were also living in the dorms along with the transition students at the time of this study. This building has several floors. The transition students occupied the first floor, while other traditional students occupied the other floors. Each floor had common areas for students to gather in addition to the separate living quarters. Living units allowed space for up to four students to be housed. Also, each floor had areas for social gatherings with televisions as well as rooms designed for study groups and tutoring. The participants in this study received the CTD intervention on the first floor, where their living quarters were and in the room designed for typical tutoring sessions. Students were provided with instruction in daily living, social skills, employment, and academics. The researcher provided two daily sessions for the CTD intervention. Each student received individual instruction with the investigator, within the dorm environment in a room designed for students to work on academic assignments.

Dependent Variable

The *Edmark* (Bruni & Hixson, 2017) series includes a curriculum that has four components for teaching functional sight words in the areas of: fast foods, grocery, job related, and signs around you. Each list contains 100 functional sight words that support students' abilities to enjoy leisure activities independently. This series was specifically chosen because the program conforms to legal mandates for teaching all students to read and because the program has a sound theoretical (based on the principles of behavioral psychology for use with students with mild to moderate disabilities) and research base. The series originated from solid research in the 1960s and utilizes a repetitive and carefully sequenced sight word approach to learning and offers great potential for success. Furthermore, the program is designed to be motivating for students who have not learned to read. The tasks are broken down into manageable components and also develops students' vocabulary, comprehension, and fluency skills.

Finally, the series has a distinctive research support base evidenced in several comparison studies for students with significant disabilities (Barrier, 1981; Browder & Xin, 1998; Conners, 1992; Sulzbacher & Kidder, 1975, 1979; Swain et al., 2015). The research-base also supports the use of constant time delay and errorless discrimination procedures for teaching sight words. Also, suggested was that the series was found effective for teaching preschool, elementary, adults, Second Language Learners, and most all students receiving special education services, especially students with significant disabilities (mild and moderate intellectual disabilities).

Participants were allowed to choose the component area in which they wished to work. Their personal interest helped them to determine which sight word component they wanted to learn words from. Three interest inventories were used with each potential participant to determine student desires. The three inventory instruments included: student Dream Sheets, a

Qualtrics questionnaire designed for students attending Summer Bridge, asking students to answer questions regarding their desires for the future including daily living, social, and academic proclivities; a Living Skills Checklist from *Transdisciplinary Vocational Assessment: Issues in School-Based Programs* that measures student competencies in daily living, academics, mobility, and social skills; and a Reading inventory from *Accommodations: Accommodating Adults with Disabilities in Adult Education Programs* that provides information on individual student perceptions of their own reading ability and desires. Allowing students to unanimously choose their word component provided them with a sense of ownership. During their personal interest inventory session, students were provided with a description of the *Edmark* series and the four components that they could choose from including: fast food, grocery, job-related, and sign words. The students individually but unanimously decided on the grocery words. Once the grocery word component was selected, researcher chose words likely unknown to the students from the selected component area, and the words were used to establish baseline. For baseline, the stimulus was provided without prompt so as not to expose the participants to the correct word before intervention.

The baseline probe (see Appendix B) allowed the investigator to determine baseline when performance indicated similar patterns at three data points. Based on student pre-assessment performance, ten words were selected. These words related to the generalization session at the end of intervention. The researcher implemented all sessions. A words-read-correct probe sheet was used for each session. The researcher scored the responses with a plus (+) if the word was read unprompted correct (RCU) or read prompted (RCP) or (-) if the word was read unprompted incorrect (UPI), prompted incorrect (PI), or no response (NR) within the individual word trial. Minutes are recorded per session. The daily probe for prompting allowed for the recording of the

words for each session including a column for recording how the word was read including: words read unprompted correct (RCU), read prompted correct (RCP), read unprompted incorrect (UPI), read prompted incorrect (PI), and read with no response (NR). The recordings for the prompting probe allowed a more detailed recording of the student's responses for discussion of the CTD's effectiveness with each individual (see Appendix C).

Research Procedures

Experimental Design

This study was based on a multiple baseline design discussed in Kazdin (2011). This design allowed for data collection to determine the extent to which the CTD intervention is most effective in terms of errors, words read correct, time needed, and sessions needed to obtain mastery (Swain et al., 2015). Once participant selection is completed, each of the four participants would enter baseline at the same time. Based on each participant establishing a steady pattern of word recognition behaviors (number of words recognized or not recognized), one would be chosen to enter the intervention phase. The first participant would receive the CTD intervention while the other three stayed in baseline with no intervention. When the first participant demonstrated a steady trend in word recognition behaviors, the intervention would be applied to the second while the others stayed in intervention. Then the third and fourth participant would move sequentially into the intervention phase. Once the fourth participant established a steady pattern, all participants would move to the generalization and later the maintenance phase.

Dependent Variables

The primary dependent variable was the number of words read correctly. A daily probe allowed for the researcher to record the number of words read unprompted correct, prompted

correct, unprompted incorrect, prompted incorrect, and no response. Number of sessions, number of errors, number of minutes to reach mastery were recorded as well to provide further data as to each participants' progress. Appendix B provides the word list that was used for determining which words, if any, the participants could recognize. Appendix C provides the Daily Probe for Prompting as described in the following data collection sessions allowing participant responses to be recorded accurately. It should be noted that words were randomized so that participants would not simply memorize them by order of presentation. The behavior momentum described earlier was embedded in the CTD intervention with a 3:1 ratio (pictures of familiar objects to a functional sight word). Data was not collected on responses for behavior momentum objects. These pictures were included to continually motivate the participants to persevere when they did not know the functional sight words.

Swain et al. (2015) utilized the measures noted above for measuring student responses including: unprompted correct responding, prompted correct responding, unprompted incorrect, prompted correct, and no response. These response options were included for the number of words read correctly probe. These measures added pertinent data for determining the degree of students' mastery. Only unprompted words read correctly and prompted words read correctly were graphed for the visual analysis and quantification so as not to confuse the findings as recommended by Browder et al. (2009).

Social validation of teacher and participants addressed the second research question regarding the degree to which the CTD was appropriate and effective for teaching functional sight words to students with significant intellectual disabilities. The teacher survey was a Likert type scale allowing thee teacher the opportunity to respond questions regarding the effectiveness and the usability of the CTD intervention. In addition, a participant survey allowed each one to

respond about their feelings regarding the use of the CTD intervention to help them learn functional sight words. The survey was a Likert type scale that encouraged the participants to respond to the questions in a format giving them options ranging from I like it to I did not like it (see Appendices D & E).

General Session Procedures

To answer research question one, the researcher provided an attention cue by calling participant name and asking him or her to look at the word, check for an attending response and present the discriminative stimulus. The instructional sessions used a 0-second delay with 5 interval response until the participant has mastered 100% prompted correct responses. The 0-second delay was provided by presenting the stimulus and at the same time presenting the prompt or second stimulus. After the 0-second delay, a 3-second prompt delay was implemented. The researcher obtained the participant's attention, ensured the participant's attention, presented the discriminative stimulus, and waited three seconds for the participant to respond. If the participant did not respond within three seconds of the discriminative stimulus, then the researcher provided a verbal model of the word (say the word) and waited three seconds for the participant to imitate the verbal model. Unprompted and prompted correct responses were reinforced with descriptive verbal praise and wait error, prompted errors, and no response were ignored. If wait errors occurred, the researcher advised the participant to wait for the prompt if they did not know the target word. One session occurred in the morning before the students leave for their employment internships or classes and one session again in the afternoon.

Baseline

The researcher determined the 10 words based on the pre- intervention probes, interest inventories, and proposed generalization session. Two sessions occurred daily with the

participant being allowed two trials for each word with a total of 40 trials per session. The researcher ensured participant attention by calling his or her name and asking the student to look at the word and then ask the student "what word". The participant was provided with 3-second delay to respond. If the participant responds correctly within three seconds, the investigator recorded the response as correct with a plus (+) and gave verbal praise. If the participant responded incorrectly within the 3-second, the response was recorded as incorrect with a (-) and ignored. If the participant did not respond, then no verbal response was recorded with NR and ignored (procedures replicated from Swain et al., 2015). There was a 3-second inter-trial interval.

CTD Instructional Sessions

The researcher provided an attention cue by calling participant name and asking him or her to look at the word, check for an attending response and present the discriminative stimulus. The instructional sessions used a 0-second delay with 5 interval response until the participant has mastered the predetermined goal for providing prompted correct responses. The 0-second delay was provided by presenting the stimulus and at the same time presenting the prompt or second stimulus. After the 0-second delay, a 3-second prompt delay was implemented. The researcher obtained the participant's attention, ensured the participant was attending, and presented the discriminative stimulus, and waited three seconds for the participant to respond. If the participant does not respond within three seconds of the discriminative stimulus, then the researcher provided a verbal model of the word (say the word) and waited three seconds for the participant to imitate the verbal model. Unprompted and prompted correct responses were reinforced with descriptive verbal praise, and wait error, prompted errors, and no responses was ignored. If wait errors occurred, the researcher advised the participant to wait for the prompt if they did know the target word. A total of 40 trials (opportunities to read the target word) were presented in two

separate sessions. The sessions occurred in the morning before the students left for their employment internships or classes and again in the evening when they returned for dinner.

Inter-Observer Agreement

Inter-observer agreement (IOA) was used for this research to determine if there was agreement between the researcher and the researcher assistant for the number of sight words recognized by each participant. Each of the four participants was taught the same list of sight words during intervention. Each received the same number of sessions and trials with the same data recording procedures described above. Furthermore, the researcher and the research assistant both counted the number of functional sight words read correct unprompted and correct prompted after the inter-observer sessions to confirm agreement and non-agreement. The research assistant sat across from the researcher and participant and tallied the number of words read unprompted and prompted. The researcher and research assistant reviewed the trials for the inter-observer data collection sessions and determined the number of agreements and disagreements for words read. IOA was obtained by having the research assistant collect data to ensure procedural fidelity data (see Appendix F) for at least 20 % of all sessions. Appendix F shows the form used for the decisions made for these data collection sessions. The research assistant recorded the steps that the researcher too to ensure that the intervention was implemented to fidelity (explained further in the following section).

Fidelity

Procedural fidelity was calculated by dividing the number of observed behaviors by the number of planned behaviors multiplied by 100. Procedural variables included: (a) presenting a stimulus for each trial, (b) presenting an active attending cue, (c) securing an active attending response, (d) presenting correct discriminative stimulus, (e) awaiting the appropriate delay

interval, (f) delivering the correct controlling prompt and consequent event, and (g) recording data during inter-trial interval (Swain et al., 2015). Procedural checklist was implemented for each session (see Appendix E).

Fidelity was obtained by having the research assistant collect data to ensure procedural fidelity data (see Appendix F) for at least 20 % of all sessions. IOA was used to determined by using a point-by-point method. The number of agreements were divided by number of agreements plus disagreements multiplied by 100. A procedural checklist was used to record implementation steps for all phases including baseline, intervention, generalization, and maintenance.

Presenting a stimulus (a) involved simply providing the word itself. In this case, the word was provided on a PowerPoint slide. A trial was the opportunity for the students to see the word. An active attending cue (b) involved calling the students name and ensuring that he/she was looking at the word allowing the student to engage with the stimulus (word). Once the student was looking at the word, the researcher knew that the participant was attending (c) and ready to receive instruction. During the 0-second delay, the researcher would provide the participant with the correct pronunciation of the word at the same time the word was displayed. When the 3-second time delay was implemented, the researcher would wait for the delay and record if the word was pronounced correctly unprompted, correctly prompted, incorrectly unprompted, incorrectly prompted, or no response. If the student recognized the word and pronounced it correctly, the researcher told the student correct. If the participant incorrectly responded, the researcher would provide the correct word or discriminative stimulus (d). The appropriate delay (e) intervals were the 0-second teaching delay and the 3-second delay allowing the participant the opportunity to practice strimulus control transfer, the opportunity to recognize the word on

his/her own. Delivering the correct controlling prompt and consequent event was provided as explained above in (c) by telling the participant if he/she was correct and proceeding to the next trail (word). If the participant could not recognize the word, he/she was told to wait for the researcher to pronounce the word so that there was errorless learning allowing the participant to practice correct responses.

Fidelity was obtained by having the research assistant collect data to ensure procedural fidelity data (see Appendix F) for at least 20 % of all sessions. A point-by-point method was used in that the number of agreements was divided by the number of agreements plus disagreements multiplied by 100. A procedural checklist was used to record implementation steps for all phases including baseline, intervention, generalization, and maintenance.

Review Trials

Review trials were held once the participant achieved the predetermined accuracy for the word set to ensure that he or she had continued exposure to the mastered words. The review trials were implemented the same as the baseline procedures except that the researcher provided the correct response if the participant made errors on trials (Swain et al., 2015).

Generalization

The participants were provided the words they mastered from the grocery list of words recorded in two different forms. One form was the words typed into a word document, and the other was a grocery list application called Flipp where the words were typed into a grocery list. This app can be downloaded on a cell phone and used when shopping. The generalization probes were used to see if they could transfer their recognition of the functional sight words to other written forms of the same words. The researcher recorded the words recognized correctly

without prompting, but these were not used as data points for visual analysis, only recorded to inform the study and any further replications.

Maintenance

Maintenance sessions were implemented after the instructional sessions were completed to assess the participant's ability to continue to read the target words following intervention. Sessions were administered the same as the baseline but with the researcher providing the correct verbal model if an incorrect response was given (Swain et al., 2015). Maintenance sessions were implemented by the researcher, one three weeks after the generalization session, and one the sixth week after generalization. The generalization sessions were held during events where all participants were present.

Social Validity

Social validity involved determining the acceptability of the intervention's use by teachers and students and is highly relevant to an intervention study. If teachers and students do not perceive the intervention as useful, then it is likely that the intervention will not be continued after the study. Specifically, social validity refers to the extent to which the behaviors being addressed, treatment procedures, and the effects of the intervention are considered socially important. (Finn & Sladeczek, 2001). Many times assessments that are used for assessing social validity are subjective in measuring the intervention outcomes and may include Likert scales, surveys, and/or interview questions (Coleman, 2012; Foster & Mash, 1999; Mule et al., 2015).

To provide the social validity data for this study, participants and teachers were asked if they believe the interventions were successful and helped students to generalize their newly learned target words to classroom and community environments. A Likert-type scale was given to the teachers to inquire about their opinion as to the effectiveness of the intervention. The

Likert scale was adapted from Kazdin (1980) Treatment Evaluation Inventory and Kelley, Heffer, Gresham, and Elliot (1989) Treatment Evaluation Inventory-Short Form (TEI-SF) which is designed to be used with college students, parents, and teachers. The Likert scale addressed nine items for teachers and can be found in the appendix. The program coordinator, who was a previous transition teacher with this program and continues to teach a class, filled out the teacher survey on her own.

In addition, researchers have recognized the importance of the unique and specific opinions that student participants can provide as to the intervention's effectiveness and acceptability (Elliot, Witt, Galvin, & Moe, in press; Kazdin, 1981). Tusco and Elliot (1986) evaluated the effectiveness of the Children's Intervention Rating Profile (CIRP, Walt & Elliot, 1983) with elementary and high school students who completed the CIRP in response to teachers' interventions implemented in the classroom and found that acceptability rating scales, such as the CIRP, are useful for determining intervention acceptability. Carter (2007) found that the CIRP has an internal consistency that ranged from .75 to .89. The CIRP is an acceptability scale adapted from the Intervention Rating Profile designed to access the suitability of interventions in educational environments as determined by teachers. The CIRP is composed of seven questions that allow students to rank their responses regarding an intervention's effectiveness using a Likert-type scale. The scale ranges from I agree to I do not agree with components of the intervention and the implementation of it by the teacher. The participants were asked individually by the researcher because they could not read all of the questions independently. (Coleman et al., 2012) if they liked learning to recognize the words using the time delay intervention and if they thought it was useful for classroom instruction (the adapted scale and all seven questions are located in Appendix D). Participants in this study found the CTD to

be effective and appropriate for learning functional sight words. Their responses ranked high from I kind of agree to I totally agree.

Data Recording

All trials were documented to record participant unprompted correct responses, participant prompted correct responses, participant unprompted incorrect responses, participant prompted incorrect response, and no response for both baseline and intervention. Data was taken for all words read correctly, number of sessions to mastery, number of errors, and number of minutes to mastery. All data was analyzed for baseline and intervention. Unprompted and prompted correct responses were plotted visually on a graph for each student for clarity of the intervention effect.

Two probe sheets (see Appendices B & C) were used for collecting data including a word list that provides space for recording with a plus (+) if the word was read unprompted correct (RCU) or read prompted correct (RCP) or with a minus (-) if the word was read unprompted incorrect (UPI), prompted incorrect (PI), or no response (NR) within the individual word trial. Minutes are only recorded for the entire session. The second probe was Daily Probe for Prompting. The words are listed vertically, and the tabs across will include columns for recording: unprompted correct responses, prompted correct responses, unprompted incorrect responses, prompted incorrect responses, and no response. The last three were recorded as errors with a (-). The first two were recorded as a (+); however only the unprompted correct responses were plotted on the graph for a visual analysis of effect size. This would clarify the progress for words recognized correctly independently, and demonstrate stimulus transfer for the student indicating that he/she independently recognized the words (Browder et al., 2009; Swain et al., 2015).

Students received two trials for each word per session. The researcher presented trials for each word, going through the list once and then repeating the list for a second trial set. To encourage the students to continue to mastery, behavior momentum (a fluency building intervention that allowed the participants to begin with high probability or less challenging tasks before attempting low probability or more challenging task) was used. This behavior momentum intervention addresses the issues of behavior and social–emotional theories of learning as discussed within the theoretical foundations in Chapter II. This intervention has been demonstrated to increase student motivation and self-efficacy to continue a task even when the task becomes more difficult and has been shown effective for students who struggle with academic task (Johns, 2015; Kelly & Holloway, 2015). As pointed out, there is a relationship between student engagement and social-emotional as well as behavior characteristics of students. Consequently, each student's basic psychological needs must be met before real learning can occur. As such, students must feel competent that they can successfully complete the academic task at hand. Imbedding a behavior momentum intervention within an academic intervention encourages students to preserver when a task is difficult (Johns, 2015; Kelly & Holloway, 2015; Saeki & Quirk, 2015). Moreover, the behavior momentum intervention speaks to the concerns of limited memory and cognitive load theory, both of which are learning characteristics of students with intellectual disabilities (Pass, Renkl, & Sweller, 2003).

For this study, the chosen words were written on index cards and uploaded to an iPad. To employ the behavior momentum within CTD procedure, pictures were taken of common items that all participants readily recognized providing them with high probability and less challenging tasks. These pictures were uploaded to the iPad along with the word cards. When delivering the discriminative stimulus (word or picture card), the researcher presented the high probability

stimulus (known pictures) with the low probability stimulus (unknown words) in a three to one ratio of high to low probability tasks.

These same procedures were repeated during all sessions. Probe sheets recorded the data for the sessions and minutes through mastery. These probes have the dates posted vertically with a tab for the session listed horizontally for the recording of a plus (+) or (-) as to whether or not the word was read unprompted and correct for each trial. Minutes were recorded for the entire length of the session. Notation were indicated as to when the student had mastered the word list with the predetermined goal for accuracy. Students participated in two sessions with a total of 40 trails, four for each individual word. For 20% of the sessions, the research assistant recorded inter-observer data using the probes. These inter-observer sessions occurred in both the morning and afternoon sessions on different days.

Data Analysis

Visual analysis was the primary data analysis used to describe the results and to determine a functional relationship. Visual analysis allowed for the inspection of four characteristics that support the determination of a functional relationship between the intervention and the behavior. In the case of this research, the researcher wanted to determine if the CTD intervention would increase functional sight word recognition for participants with significant intellectual disability. Therefore, participant data could be visually analyzed to determine the four characteristics that constitute visual inspection: mean, level, trend, and latency. The rate or mean changes show averages for the data; while the shift or level of the data show increases or decreases from the end of a phase to the beginning of the next phase (Kazdin, 2011). Additionally, trend or slope can be analyzed to determine systematic increases or

decreases throughout the intervention phase, and latency can be used to determine the length of time change occurs after phase change (Kazdin, 2011).

A secondary analysis was the Non-Overlap of All Pairs. The Non-Overlap of All Pairs is a method for determining performance changes from one phase to another and is described in Chapter V in the Results section. The method is suggested as a standard for evaluating single-case research. Although it is not always needed for visual analysis, it is a method for quantifying the effect sizes. Non-overlapping data describes the extent to which the data in baseline and intervention overlap (Parker & Vannest, 2009).

Visual analysis does not allow for analysis across studies. Applying the non-overlap of all pairs allows the results to be quantified for more assessable comparisons. The Non-Overlap of All Pairs method simply means calculating the number of comparison pairs showing no overlap and dividing by total number of comparisons, providing the percentage of non-overlap data that exists between baseline and intervention. The method provides a complete evaluation of all possible comparisons of data between baseline and intervention. The data point comparisons are interpreted by adding a value of 1 to indicate perfect improvement, 0.5 indicating no change, and a 0 for perfect reduction. This method allows for a comprehensive analysis of all data points. Each student's results were visually represented and included for baseline, intervention, generalization and maintenance phases (Parker & Vannest, 2009).

Assumptions of the Study

My assumptions were that participants in a transition program on a large university campus would learn to recognize functional sight words, generalize, and maintain the new words. It was also assumed that they would want to continue to work with the CTD procedure to increase their

literacy skills. The students were assumed to have a sense of independence in that they would be able to access common grocery words in varied forms.

Limitations of the Study

Limitations in this study included the small number of participants with there being only four for this study. One specific limitation is the researcher bias that is inherent in a study where the researcher is also the instructor. These limitations may be addressed in future studies.

Summary

Students with significant disabilities can learn with the appropriate support. Educators must have evidence-based practices that have proven effective and meaningful for their specific student population. Therefore, there is a need for more studies that include students with specific characteristics to provide the needed research base. This study used a CTD prompting response procedure to support student recognition of functional sight words in a transition setting so that the participants can practice self-determination in making their own choices and accessing community resources independently. A single-subject multiple baseline design was used to assess the results for the CTD intervention in supporting students with significant intellectual disabilities recognition of the functional sight words. Furthermore, it is hoped that students will begin to build a foundation for future literacy goals in post-secondary academic, employment, and leisure structures.

CHAPTER IV:

RESULTS

Introduction

This chapter provides an overview of the visual and the non-overlap of all data points analyses used to answer the research questions. Each participant's results are discussed separately as well as comparatively to develop a more complex understanding of what each participant achieved individually and in comparison to other participants in the study. A visual analysis graph is provided for each participant as well as a stacked visual analysis graph for compiling all participants' results. Additionally, fidelity, social reliability, and inter-observer measures are discussed. The research questions included the following:

1. Does constant time delay (CTD) used when teaching functional sight words increase a student's word recognition as measured in words read correctly at intervention; and
2. Do teachers and students find the use of the CTD procedure for teaching and learning functional sight words appropriate and effective?

A multiple baseline across participant design was used to establish a functional relationship between the intervention and participant increase in recognition of ten target functional sight words for individuals with intellectual disabilities in a summer transition program. Visual analysis was invoked to determine the slope and trend across phases and at least three data points within phases. The researcher and the participants determined the component of the *Edmark* functional sight word reading curriculum that would be used for the study. The

researcher chose ten words from the selected component with which the students were likely to have little familiarity. The words were put into a PowerPoint with one word typed onto one slide. In addition, a 3:1 ratio for behavior momentum objects to word slides was used. Therefore, three slides consisted of familiar pictures of common objects or settings (Johns, 2015; Kelly & Holloway, 2015). This allowed the participants to become motivated by being capable of recognizing the pictures while not being able to recognize the words. Again, words and pictures were randomized for each session. As a result, participants were motivated to continue working because they successfully recognized some of the slides while they established recognition of the others. Furthermore, the word orders were changed so that participant memorization would not impact the study results.

The researcher provided an attention cue by calling participant's name and asking him or her to look at the word, check for an attending response and present the discriminative stimulus. The instructional sessions used a 0-second delay with 5-second interval response until the participant mastered 100% prompted correct responses. The 0-second delay was provided by presenting the stimulus and at the same time presenting the prompt or second stimulus. After the 0-second delay, a 3-second prompt delay was implemented. The researcher obtained the participant's attention, ensured the participant's attention, presented the discriminative stimulus, and waited three seconds for the participant to respond. If the participant did not respond within three seconds of the discriminative stimulus, then the researcher provided a verbal model of the word (stated the word) and waited three seconds for the participant to imitate the verbal model. Unprompted and prompted correct responses were reinforced with descriptive verbal praise and wait error, prompted errors, and no response were ignored. If wait errors occurred, the researcher advised the participant to wait for the prompt if they did not know the target word. Two sessions

occurred in the morning before the students left for their employment internships or classes and two sessions again in the afternoon (see Appendices B and E).

For generalization, two probes were utilized. The first probe was a copy of the words typed into a Word document, and the second probe used a phone app (Flipp) that allowed for the words to be typed into a grocery list format. For maintenance, the participants were assessed at three and six weeks to see if they had maintained word recognition. Visual analysis and non-overlap of all pairs (Parker & Vannest, 2009) was applied to quantify the results.

Practice sessions were held in the morning and evening. Two sessions were held in the morning.

Findings

Evaluating the results from a multiple baseline design allows the researcher and others to make inferences about the intervention. Once the behavior being studied is assessed and evaluated in an appropriate design, the data can then be evaluated to determine the extent of the behavior change with intervention. Two criteria that are considered when evaluating single-subject designs are experimental and applied criterion. The experimental criterion is met by determining whether the behavior changes are in the desired direction (increases or decreases) when the intervention is applied establishing whether the change is a result of the intervention. The applied criterion is concerned with the efficiency or importance of the improved behavior for the participant's life. To make inferences about the data, visual inspection is invoked to determine if there is a reliable and systematic change in behavior each time the intervention is applied. This visual inspection is carried out through visual analysis or visually looking at the graphed data. Visual inspection reveals potent or large results when the behavior changes drastically from baseline to intervention.

Four criteria were applied to analyze the data using visual inspection. These criteria consisted of four characteristics relating to magnitude and rate of the change in the behavior across phases that can be easily seen when using graphed data for visual inspection. To determine the magnitude of change across phases, the researcher would look at the mean and the level. The mean is the average number of the behaviors recorded while level refers to the shift in performance considered at the end of a phase and the beginning of another. To determine the rate of change, the researcher would look at the change in trend and latency. Trend refers to the visual inspection of the data indicating increases and decreases in behavior over phases; while latency refers to the time between the phases and the change in behavior. The closer the change is to the intervention, the more obvious the intervention effect. Therefore, if visual inspection detects changes across phases in means, trends, levels, and latency and there are few overlapping data points, if any, then it is clear that the intervention produced the changes in the behavior and that these changes are consistent resulting in experimental criteria being met.

For this research, visual inspection and the non-overlap of all pairs were used to describe and quantify the intervention effect. Non-overlap of all pairs is a method for determining performance changes from one phase to another. The method is suggested as a standard for evaluating single-case research. Although it is not always needed for visual analysis, it is a method for quantifying the effect sizes. Non-overlapping data describes the extent to which the data in baseline and intervention overlap (Parker & Vannest, 2009). Visual analysis does not allow for analysis across studies. Applying the non-overlap of all pairs allows the results to be quantified for more assessable comparisons. The non-overlap of All Pairs analysis simply requires calculating the number of comparison pairs showing no overlap and dividing by total number of comparisons, generating the percentage of non-overlap data that exists between

baseline and intervention. The method provides a complete evaluation of all possible comparisons of data between baseline and intervention. The data point comparisons are interpreted by adding a value of 1 to indicate perfect improvement, 0.5 indicating no change, and a 0 for perfect reduction. This method allows for a comprehensive analysis of all data points. The steps included the following:

1. For each phase A or Baseline data point, add 1 for each point B (intervention) data point that exceeds point A; add 0.5 for each phase B data point that ties with point A; add 0 for each phase B data point that is less than point A data point;
2. Add all the values for both phases and multiply (10 data points in phase A and 11 data points in phase B would be 10x 11=110); and
3. Divide the sum from step 2 by the total number of comparisons.

For example, if there are 10 data points possible in phase A and 11 data points possible in phase B, then multiply 10 x 11. The product is 110 values. For instance, an example would be as follows, consider that 106 data points do not overlap.

Therefore, 96% of intervention data do not overlap with baseline data. Table 3 provides an example of what the data analysis may look like. Calculations equal 106/110 (total number of comparisons) = 0.96 or96% of the intervention data do not overlap with baseline data. Applying non-overlap of all data to research effects provides a comprehensive method of analysis as well as a common language that allows for efficacy comparisons across similar studies.

Table 3

Example of Data Analysis

Intervention Baseline	5	9	7	9	7	5	9	11	11	10	9	Total
4	1	1	1	1	1	1	1	1	1	1	1	11
3	1	1	1	1	1	1	1	1	1	1	1	11
4	1	1	1	1	1	1	1	1	1	1	1	11
3	1	1	1	1	1	1	1	1	1	1	1	11
4	1	1	1	1	1	1	1	1	1	1	1	11
7	0	1	.5	1	.5	1	.5	1	1	1	1	8
5	.5	1	1	1	1	.5	1	1	1	1	1	10
2	1	1	1	1	1	1	1	1	1	1	1	11
3	1	1	1	1	1	1	1	1	1	1	1	11
2	1	1	1	1	1	1	1	1	1	1	1	11
Total												106

For the present study, the goal was to increase word-recognizing behavior. Therefore, the higher the scores in phase B (as compared to phase A) indicated non-overlap. In addition, the non-overlap of all pairs allows for comparisons across subjects as well as stimulus conditions including contexts and protocols (do the performance changes generalize). Consequently, visual analysis includes participant data point for all phases including baseline, intervention, generalization, and maintenance. Graphs are attached for visual comparisons as well as presented individually to demonstrate progress for both unprompted and prompted correct responses. Tables for the non-overlap of all pairs for each student are also presented to demonstrate the comparison of baseline and intervention data points (see Figure 1).

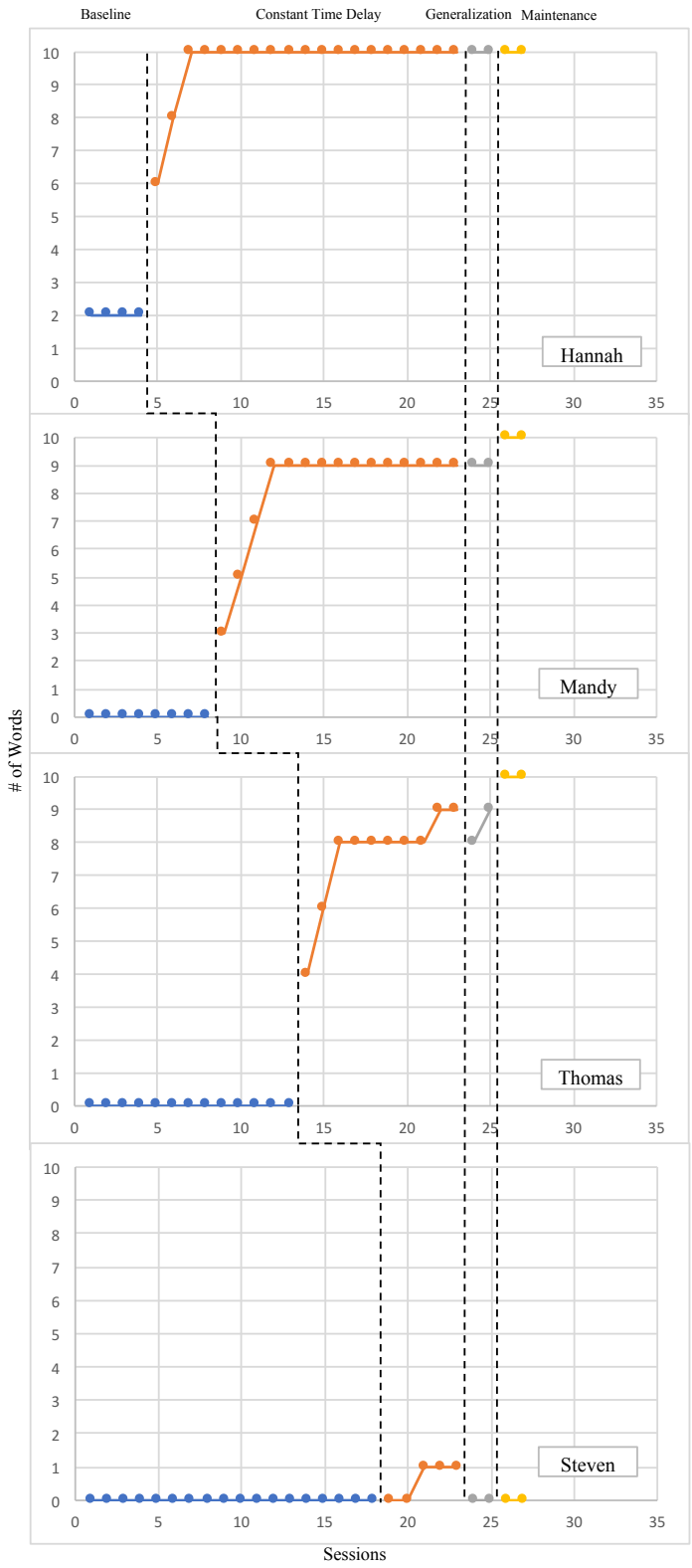

Figure 1. Graphs

Hannah was the first participant to enter baseline and remained in baseline for four days and established a pattern of recognizing two of the targeted words correctly on each of the four days. She was in intervention for two and a half weeks. On the first day of intervention after the practice session, Hannah was able to identify six target words unprompted correct and four words prompted correct. On the second day of intervention, Hannah identified eight words unprompted correct and two words prompted correct. On the next sixteen days of intervention, Hannah identified all ten words unprompted correct. Hannah was able to generalize all ten words unprompted correct for both generalization probes. She identified all target words for the three and six-week maintenance sessions. Hannah mastered all of the target words 27.21 minutes in 6 sessions with no errors. Hannah completed 72 total sessions including18 data collection sessions. When applying the non-overlap of all pairs data analysis procedure, Hannah demonstrated no overlap of data points when comparing baseline to intervention. For total comparisons, (4 x 17 = 68) sum divided by total comparisons: (68/68 = 1) (or 100%).

Table 4

Hannah, Non-Overlap of all Pairs

Phase B	6	8	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	Total
Phase A																		
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	17
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	17
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	17
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	17
Total																		68

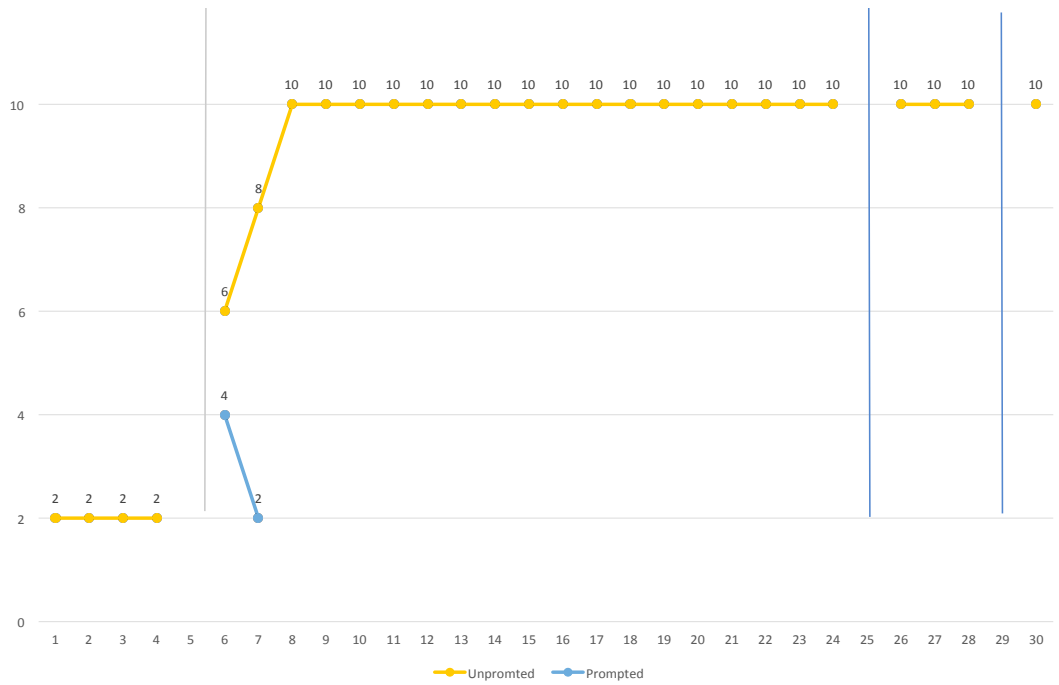

Figure 2. Hannah, prompted and unprompted baseline and intervention

Once Hannah moved to the intervention phase, Mandy moved into baseline and spent one week in baseline. She was not able to identify any of the target words. She spent approximately two weeks in intervention establishing a pattern. On the first day of intervention after the practice session, Mandy was able to identify three target words unprompted correct and seven target words prompted correct. On the second day of intervention, Mandy identified five target words unprompted correct and four words prompted correct. On the third day of intervention, Mandy identified seven words unprompted correct and three words prompted correct. On the fourth and fifth day of intervention, Mandy identified nine target words unprompted correct and one word prompted incorrect. On the sixth through the fifteenth day of intervention, Mandy identified nine of the ten words unprompted correct and one of the ten words prompted correct. Mandy was able to generalize the nine unprompted correct words to both generalization probes but did not correctly identify one word on either form. This was the same word she read prompted correct during intervention. Mandy was able to maintain all words during the three and six-week

maintenance session. Mandy mastered the nine target words consistently in 60 total sessions including 15 data collection sessions taking approximately 26.45 minutes to mastery with two errors. Mandy did not demonstrate any overlap of data points when comparing baseline to intervention. For total comparisons, (6 x 15 = 90) sum divided by total comparisons: 90/90=1 (or 100%).

Table 5

Mandy, Non-Overlap of all Pairs

Phase B	3	6	7	9	9	9	9	9	9	9	9	9	9	9	9	Total
Phase A																
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15
Total																90

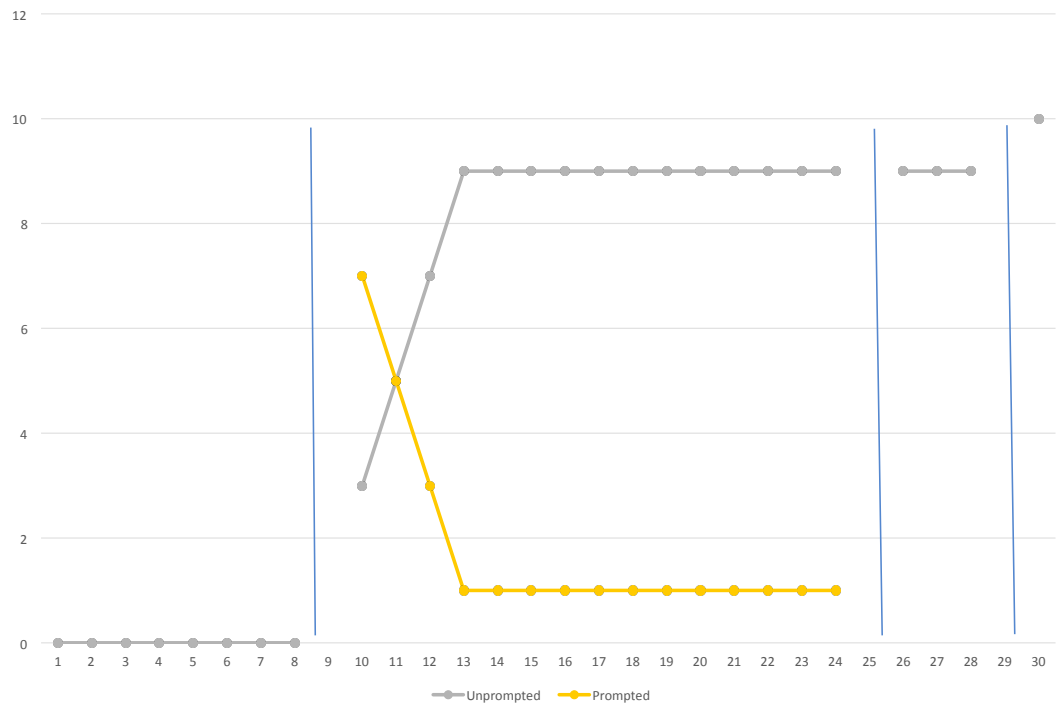

Figure 3. Mandy, prompted and unprompted baseline and intervention

Once Mandy moved to the intervention phase, Thomas moved into baseline for approximately two weeks. He could not identify any of the targeted words throughout this phase. Once in intervention, Thomas exhibited an increase in word recognition daily. After the practice session on the first intervention date, Thomas was able to read four words unprompted correct, five words prompted correct, and one word unprompted incorrect. The second intervention date, Thomas read six words unprompted correct and four words prompted correct. The third intervention date, Thomas again read six words unprompted correct and four words prompted correct. On the fourth intervention date, Thomas increased to eight words unprompted correct and two words prompted correct. On the fifth and sixth intervention date, Thomas continued with eight prompted correct and two unprompted correct words. Anecdotal reports indicated that Thomas could actually identify all targeted words; however, identification took five seconds instead of the three seconds allowed for the CTD procedure used for this study.

Thomas continued this pattern on the seventh day of intervention. On the eighth through the tenth day of intervention, Thomas identified nine target words unprompted correct and one target word prompted correct. The generalization phase allowed for Thomas to read the target words from two different probes that were different from the intervention probe (the iPad with behavior momentum). Thomas was able to read nine words unprompted correct from the word document and all 10 of the target words unprompted correct from the grocery list app. Thomas was able to identify all words unprompted correct at three and six-week maintenance. He mastered nine to ten target words in 40 total sessions including 10 data collection sessions taking approximately 22.6 minutes to recognize 9 of the 10 target words with one prompted incorrect error. Thomas demonstrated no overlap of data points in comparing baseline to intervention. For comparisons, (13 x 10 = 130) sum divided by total comparisons: 130/130 = 1 (or 100%).

Table 6

Thomas, Non-Overlapping of all Pairs (Unprompted Correct)

Phase B	4	6	6	8	8	8	8	9	9	9	
Phase A											
0	1	1	1	1	1	1	1	1	1	1	10
0	1	1	1	1	1	1	1	1	1	1	10
0	1	1	1	1	1	1	1	1	1	1	10
0	1	1	1	1	1	1	1	1	1	1	10
0	1	1	1	1	1	1	1	1	1	1	10
0	1	1	1	1	1	1	1	1	1	1	10
0	1	1	1	1	1	1	1	1	1	1	10
0	1	1	1	1	1	1	1	1	1	1	10
0	1	1	1	1	1	1	1	1	1	1	10
0	1	1	1	1	1	1	1	1	1	1	10
0	1	1	1	1	1	1	1	1	1	1	10
0	1	1	1	1	1	1	1	1	1	1	10
0	1	1	1	1	1	1	1	1	1	1	130

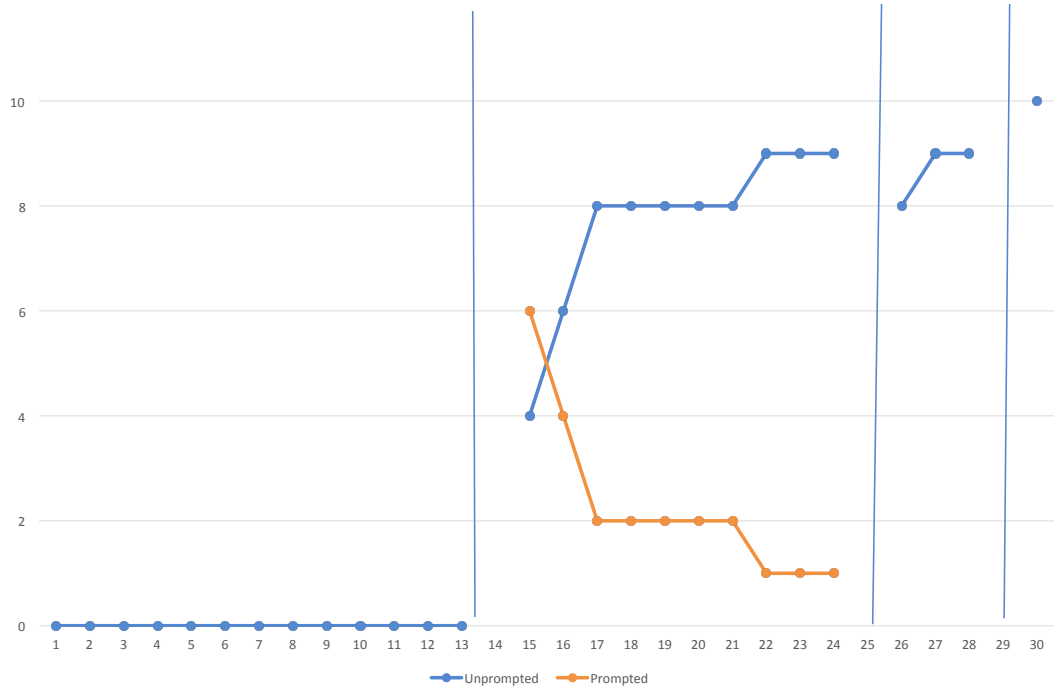

Figure 4. Thomas, prompted and unprompted baseline and intervention

Steven was in baseline for two and a half weeks. He was not able to identify any of the ten target words during this phase. For intervention, Steven demonstrated a pattern for identifying nine words prompted correct and one word unprompted correct. Steven was not able to generalize nor maintain any of the target words. In comparing Steven's baseline to intervention phases, he had two sessions of overlapping data points. Steven did not master the target words when reading unprompted correct; however, he was able to read all words prompted correct in his 20 intervention sessions including five data collection sessions. Steven's tables for unprompted correct as well as prompted correct are included below to provide the reader with a visual for his performance under both stimulus conditions. For total comparisons, (16 x 5 = 80) sum divided by total comparisons: 64/80 =.80 (or 80%).

Table 7

Steven, Non-Overlapping of All Pairs (Unprompted Correct)

Phase B	0	0	1	1	1	Total
Phase A						
0	.5	.5	1	1	1	4
0	.5	.5	1	1	1	4
0	.5	.5	1	1	1	4
0	.5	.5	1	1	1	4
0	.5	.5	1	1	1	4
0	.5	.5	1	1	1	4
0	.5	.5	1	1	1	4
0	.5	.5	1	1	1	4
0	.5	.5	1	1	1	4
0	.5	.5	1	1	1	4
0	.5	.5	1	1	1	4
0	.5	.5	1	1	1	4
0	.5	.5	1	1	1	4
0	.5	.5	1	1	1	4
0	.5	.5	1	1	1	4
0	.5	.5	1	1	1	4
Sum						64

For total comparisons, 80 sum divided by total comparisons: 80/80 = 1. (or 100%).

Table 8

Steven, Non-Overlapping of All Pairs (Prompted Correct)

Phase B	10	10	9	9	9	Total
Phase A						
0	1	1	1	1	1	5
0	1	1	1	1	1	5
0	1	1	1	1	1	5
0	1	1	1	1	1	5
0	1	1	1	1	1	5
0	1	1	1	1	1	5
0	1	1	1	1	1	5
0	1	1	1	1	1	5
0	1	1	1	1	1	5
0	1	1	1	1	1	5
0	1	1	1	1	1	5
0	1	1	1	1	1	5
0	1	1	1	1	1	5
0	1	1	1	1	1	5
0	1	1	1	1	1	5
0	1	1	1	1	1	5
Sum						80

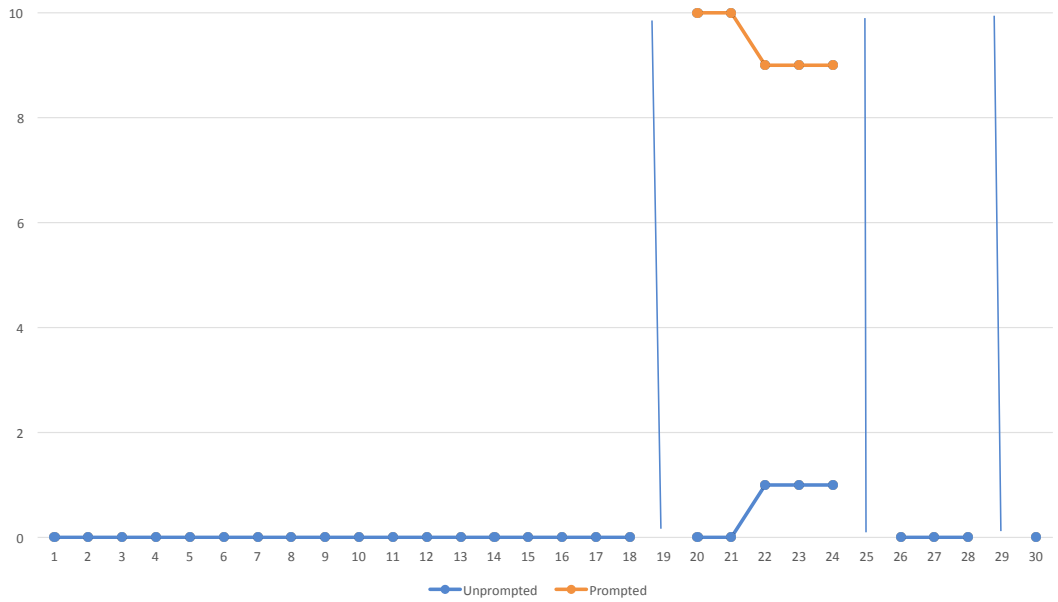

Figure 5. Steven, prompted and unprompted baseline and intervention

Figure 6 provides an overview for all participants of unprompted baseline and intervention phase with trend lines. As such, the data show that three participants mastered eight to ten of the target words as well as their trend lines demonstrating their upward progress. One participant did not show the same trend in his progress but did demonstrate an upward pattern at end of intervention.

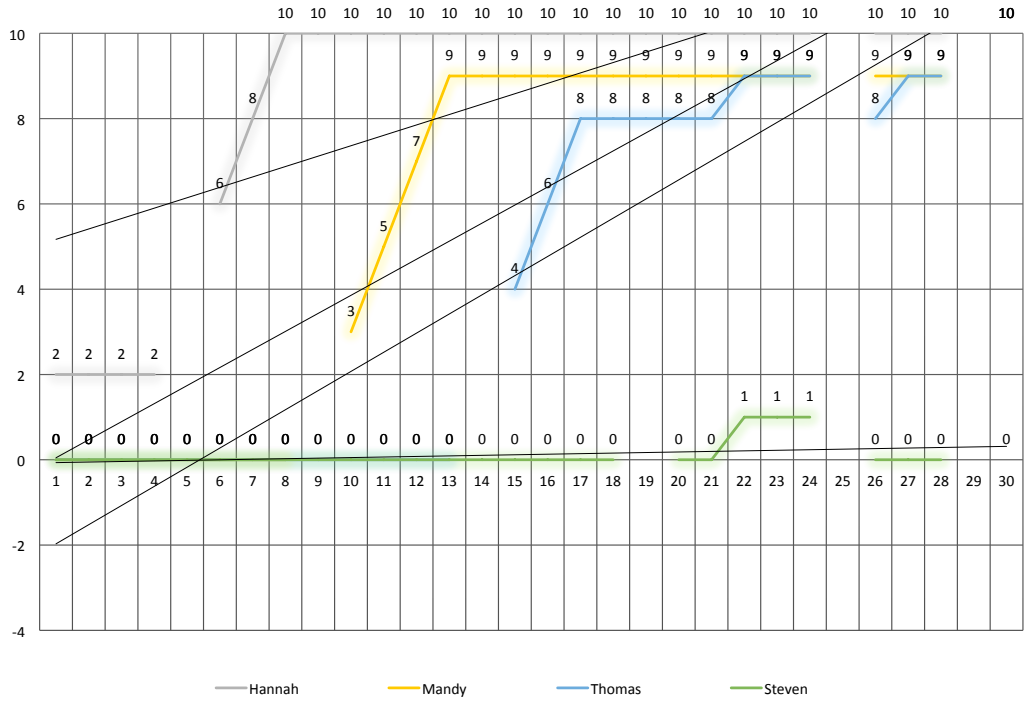

Figure 6. Overview of unprompted baseline and intervention

Fidelity

Procedural fidelity was calculated by dividing the number of observed behaviors by the number of planned behaviors multiplied by 100. Procedural variables included (a) presenting a stimulus for each trial, (b) present an active attending cue, (c) securing an active attending response, (d) presenting correct discriminative stimulus, (e) awaiting the appropriate delay interval, (f) delivering the correct controlling prompt and consequent event, and (g) recording data during inter-trial interval (Swain et al., 2015). Procedural checklist was implemented for each session (see Appendix F).

Social Validity

As discussed in Chapter III, to provide the social validity data for this study, participants and teachers were asked if they believed the interventions were successful and helped students to generalize their newly learned target words to classroom and community environments. A

Likert-type scale was given to the research assistant to inquire about their opinion as to the effectiveness of the intervention. The Likert scale was adapted from Kazdin (1980) Treatment Evaluation Inventory and Kelley, Heffer, Gresham, and Elliot (1989) Treatment Evaluation Inventory-Short Form (TEI-SF) which is designed to be used with college students, parents, and teachers. The Likert scale addressed nine items for teachers and can be found in the appendix (see Appendix E).

In addition, researchers have recognized the importance of the unique and specific opinions that student participants can provide as to the intervention's effectiveness and acceptability (Elliot, Witt, Galvin, & Moe, in press; Kazdin, 1981). Tusco and Elliot (1986) evaluated the effectiveness of the Children's Intervention Rating Profile (CIRP, Walt & Elliot, 1983) with elementary and high school students who completed the CIRP in reaction to teachers' interventions implemented in the classroom and found that acceptability rating scales, such as the CIRP, are useful for determining intervention acceptability. Carter (2007) found that the CIRP has an internal consistency that ranged from .75 to .89. The CIRP is an acceptability scale adapted from the Intervention Rating Profile designed to access the suitability of interventions in educational environments. The CIRP is composed of seven questions that allow students to rank their responses regarding an intervention's effectiveness using a Likert-type scale from I like to I do not like the components of the intervention and the implementation of it by the teacher. Students were asked individually (Coleman et al., 2012) if they liked learning to recognize the words using the time delay intervention and if they thought it was useful for classroom instruction. An adapted CIRP was used to provide social validity for this study (see Appendix D). Both the research assistant and the participants in this study found the CTD to be effective

and appropriate for learning functional sight words. The student responses ranked high from I kind-of agree to I totally agree.

Inter-Observer Agreement

Inter-observer agreement (IOA) was obtained by having the research assistant collect data for agreements on word responses for at least 20 % of all sessions. IOA will be determined by using a point-by-point method. The number of agreements were divided by number of agreements plus disagreements multiplied by 100. For all sessions, the researcher obtained 97.2% inter-observer agreement (see Appendix F).

Summary

This chapter discussed the results of the study for implementing a CTD intervention with students who have an intellectual disability attending a transition program on a large university campus. The results demonstrated a potent result for using CTD to teach the recognition of functional sight words to these participants suggesting that students with significant intellectual disabilities can learn target words. The next chapter will discuss the results more fully as well as discuss implications and future research needs.

CHAPTER V:

DISCUSSION

Introduction

This chapter will restate the research questions, discuss the study's findings and connect these findings to the larger research body reviewed in Chapter II. Additionally, implications and further research needs will be identified. The purpose of this study was to investigate the use CTD for teaching transition students to recognize functional sight words. The research questions were:

1. Does constant time delay used when teaching functional sight words increase student's word recognition as measured in words read correctly at intervention; and
2. Do teachers and students find the use of the CTD procedure for teaching and learning functional sight words appropriate and effective?

Using CTD in a transitional summer program on a large university campus was found effective for supporting student recognition, generalization, and maintenance of 10 functional sight words related to grocery words for four participants. However, the fourth participant did not show significant improvement. This particular participant entered the intervention phase and demonstrated an upward pattern but did not master the 10 words correctly unprompted. He did master the 10 words correctly prompted. Considering that three participants were able to recognize, generalize words across two different probes and contexts, and maintain all 10 words

after three and six weeks without intervention, CTD can be considered effective for teaching participants with intellectual disabilities in a transition program functional sight words.

Summary of Findings

When applying visual inspection to the graphed data for this research, inferences can be made about the intervention effect. Looking at the graphs for each student and invoking the four criteria of mean, level, trend, and latency to determine experimental criterion make evident the potent effects for the three out of four of the participants. Beginning with Hannah, baseline shows that she was able to identify two out of the ten words during baseline but that as soon as the intervention was applied, she made immediate success. Hannah stayed the same for four data points being that she recognized two functional sight words each time. Once the intervention was applied, she made immediate improvement. She progressed to six, eight, and ten words read unprompted correct within three days of the intervention phase. She stayed at 10 words unprompted correct for remaining days of intervention which was 17 days, generalization for two different probes, and maintenance for three and six weeks. The average or mean for Hannah during intervention was 9.7 compared to 2 for baseline. Therefore, the visual inspection demonstrated that the mean and level of performance for intervention increased by over 7 words read unprompted correct. Additionally, Hannah demonstrated an increase in trend and latency showing that her word reading behaviors increased systematically and that the latency period showed immediate results after the intervention was applied.

Mandy also demonstrated immediate effects. She spent 8 days in baseline and had 8 data points showing 0 words read unprompted correct. She spent 15 days in intervention, showing immediate increases in words read unprompted correct progressing from 3, 5, 7, and 9. She stayed at 9 for the remainder of intervention as well as for two probe generalization data points.

Surprisingly, she read 10 words unprompted correct for three and six weeks maintenance sessions. As with Hannah, Mandy showed immediate increases in mean and level with an average words read unprompted correct of 8.2, demonstrating 8.2 words over baseline. Also, as with Hannah, Mandy exhibited increases in trend and latency as her word reading behaviors increased systematically and her latency period for improvement was immediate even though not as significant as Hannah.

Thomas spent 13 days at 0 words read unprompted correct. In comparison to Hannah and Mandy, Thomas also showed immediate progress toward reading the total of 10 words. Thomas read 4, 6, and 8 words unprompted correct for the first three days of intervention. For six days of intervention, Thomas stayed at 8 words unprompted correct, and for two days of intervention, he read 9 words unprompted correct. For the two generalization probes, Thomas read 9 and 10 words unprompted correct. As with Hannah and Mandy, Thomas showed immediate increases in mean and level with an intervention mean of 7.6 over baseline. Again, as with the first two participants, Thomas showed immediate increases in trend and latency. However, his gains were not as immediate as the first two participants.

Finally, Steven spent 18 days in baseline and five days in intervention. As can be seen in the graphed data, Steven stayed in baseline with 0 words read unprompted correct and only gained 1 word read unprompted correct for three intervention data points. In comparison to the other three participants, Steven did not show potent effects. He had an average 0.6 words read unprompted correct for intervention over 0 for baseline. Steven did not demonstrate the mean, level, trend or latency that the other participants achieved.

In looking at all four participants and reviewing the results in Chapter IV, Hannah took 27.21 minutes to master all 10 target words with no errors and no overlap of data points. Mandy

recognized 9 of the 10 target words in 26.45 minutes with no overlap of data points. Thomas needed 22.6 to recognize 9 out of ten target words with no overlap of data points, and Steven was only able to recognize 1 of the 10 target words consistently but was able to respond correctly for all 10 words prompted correct for all sessions. Steven did have only 80% of non-overlap of all data points for unprompted correct but did achieve 100% non overlap for prompted correct.

Reflecting back to the literature for teaching students with a range on intelligence measures, Allor et al. (2014) found that participants whose IQs were in the borderline range, 75, took 52 weeks to move from 20-60 in words read per minute. Participants whose IQ was between 70-80 took one and a half year to read 20-60 words per minute. Participants with IQs in the range of 59-69 took three years to move from 10-60 words read per minute, and participants with IQs in the 40-50 range took three and a half years to move from 0-20 words per minute. Even though this research is in reference to participants reading connected text, it is obvious that individuals with lower IQ scores struggle to read words. However, the authors did discuss that IQ was not always directly correlated with participant's ability as some individuals with lower scores on IQ performed higher in reading words per minute than did participants with higher IQ scores. Even though Allor et al., 2013 investigated interventions to increase reading fluency, the authors were looking at words read per minute. In the present study, only the recognizing of 10 target functional sight words was measured and not with a time limit. Both studies reveal that participants with low IQs in the moderate to significant intellectual disability range can learn to recognize and read words.

For the Allor et al., 2014 study, the participants in the lower IQ ranges took significantly more time to learn to read words correctly than did students with higher IQs. In this present study, three of the four students, learned very quickly to recognize functional sight words.

However, the interventions were different and the dependent variables were different. Allor et al. was measuring ability to read connected text; while this study was measuring the ability to recognize individual functional sight words utilizing a CTD intervention with an embedded behavior momentum component which may have made learning more attainable. All in all, what this present study, as well as the Allor et al. study and others have suggested, is that students with significant intellectual disabilities can learn to recognize words and learn to read functionally even if it takes much longer for them than typical students. Also, as Allor et al. pointed out, IQ does not determine reading potential as the authors found that students with lower IQs sometimes performed higher than students higher IQs. The present study as well revealed the same in that Thomas who had a 41 performed better than Steven who had a 47 IQ score and almost equally as well as Hannah who had a 56 IQ score. Additionally, Thomas performed in less time than Hannah.

As is evident in the discourse within the findings and as just discussed three out of four of the students (Hannah, Mandy, and Thomas) mastered the target word list and were able to generalize and maintain all of the target words at both three and six-week maintenance checks. The fourth student who entered the intervention phase last struggled to recognize any of the words but did begin to make progress. However, he was not able to generalize nor maintain the word that he had learned to recognize. It is possible that he could have recognized more of the words with a longer intervention phase. He was learning to make associations with the words; for example, seeing the word margarine but recognizing it as butter.

Additionally, for Thomas, behavioral momentum appeared to provide motivation for continuing his efforts to attain recognition of all 10 target words. Inasmuch, Steven did not attain nor maintain target word recognition. He did find success in recognizing the pictures of common

objects used for the behavior momentum component of the CTD intervention. Furthermore, these two participants were able to use the pictures to make connections to additional concepts increasing their learning experiences.

As discussed in Chapter II, Saeki and Quirk (2015) elaborated on the importance of meeting student's basic psychological as well as social-emotional needs and further noted that the needs should be met before addressing student engagement concerns. In their study addressing student engagement, they found a relationship among student engagement, social-emotional and behavior, and the extent to which student's basic psychological needs were met. The authors further discussed the need for students to feel that they are competent to successfully complete a specific task. The authors pointed out that schools should foster the development of strategies that allow students to feel they have autonomy as well as a connection to the classroom environment. As already noted, behavior momentum is a fluency building intervention that allows a task to be designed individually to increase student confidence to persevere when a task becomes difficult (Johns, 2015; Kelly & Holloway, 2015). In the present study, this intervention was effective in securing continued engagement for all four participants and allowed for each to experience success with the intervention. Indeed, the present study corroborated the findings of the previous studies just discussed adding to the literature-base support for incorporating behavior momentum strategies within academic interventions (Johns, 2015; Kelly & Holloway, 2015; Saeki & Quirk, 2015).

Similarly, Volpe et al. (2011) and Burns (2007) stated that they found success using known words at a higher ratio to unknown words to increase opportunities to respond resulting in higher rates of mastery for students with significant intellectual disabilities. Participants in this study participated in two sessions with a total of 40 trials to read the ten target words providing

them with numerous opportunities to respond (Burns, 2007). Additionally, behavior momentum provided opportunities for successful responses from the beginning of the intervention phase. Moreover, these response opportunities incited the students to elaborate on their prior experiences connected with the picture objects used for the behavior momentum component. Although, behavior momentum was not the focus of this study, these findings can be expanded upon in future studies to determine the impact of behavior momentum embedded in literacy interventions to increase student learning.

As discussed in Chapter I, researchers and practitioners need interventions and procedures that possess the essential components inherent in student learning characteristics including memory, attention, appropriate behavior, attending, and skill transference including stimulus control (Allor et al., 2014; Coleman et al., 2015). Vis a vis' the components comprising time delay procedures, specifically CTD, addressed these specific participant characteristics in that the intervention provided each participant with a response prompting procedure giving him/her time to process and arrive at the correct response (Browder et al., 2009). Moreover, studies that suggested that time delay strategies can be effective with a range of students of varying ages was also affirmed in this study as the participants ages ranged from 19 to 30 (Walker, 2008).

The essential finding of this study is that students with intellectual disabilities can learn to recognize functional sight words with the appropriate intervention (Browder et al., 2009; Horner et al., 2005). One essential feature of the CTD intervention is the transfer of the stimulus control from the practitioner to the student. This allows students to increase autonomy for their own learning with less and less teacher support. Students with significant intellectual disabilities need to acquire transference of particular skills for independence that will allow them more

opportunities to make their own choices as well as have greater community access and a better quality of life (Allor et al., 2014; Coleman, 2015). Three of the four participants in this study were able to not only generalize but maintain the all 10 target words across probes and settings.

More specifically, this study substantiates and expands the research base for using CTD as an evidence-based intervention for supporting students' recognition of functional sight words (Cohen, Heller, Alberto, & Fredrick, 2008; Walker, 2008;Waugh et al., 2011a; Waugh, Fredrick, & Albert, 2009). Further, Collins et al., (2007) found that students with intellectual disabilities in elementary, middle, and secondary school in both the resource room and general education classrooms met criterion for acquisition of both functional and curriculum-based sight words. Particularly regarding the present study, Swain et al. (2015) compared the use of a progressive time delay and a constant time delay to determine the effectiveness for teaching functional sight words to students with ID or with a dual diagnosis of moderate ID and autism spectrum disorder (ASD). The authors found that both interventions were effective for teaching functional sight words but that CTD was more efficient with number and percent of errors through criterion across all students; CTD was more efficient for sessions through criterion for two participants and equal for one with SP being more efficient for one participant but only with a difference of one session, and CTD was more efficient (lower) for trials though criterion for two participants, equal for one with SP being lower for one participant (Swain et al., 2015).

Swain et al., (2015) reported mixed results from previous studies. Four previous studies found from a review of CTD and SP comparisons including Kurt and Tekin-Iftar (2008), Head et al., (2011), Risen et al., (2003), Schuster et al., (1992), and Tekin and Kircaali-Iftar (2002) Therefore, this study implemented only one time-delay procedure to concentrate on the inherent components of CTD as well as the specific characteristics of the participants to address

researcher concerns for determining the appropriate evidence-based intervention for certain populations.

The present study added to these studies as well as the Swain et al., (2015) study expanding the findings to include a more detailed descriptions of participant characteristics. Understanding participant characteristics and matching those characteristics to intervention components increases success for learning. For this study, the researcher concentrated of the effects of implementing only CTD for supporting participant's recognition of functional sight words. Previous studies' findings suggested that CTD was effective for teaching sight words in regard to sessions, trials, and number and percent of errors through criterion. Moreover, studies have demonstrated that students with ID in elementary, middle, and secondary schools in both the resource room and general education classrooms met criterion for acquisition of both functional and curriculum-based sight words (Collins et al., 2007). Overall, the use of CTD as an intervention for teaching functional sight words has been found effective in this study as well as in previous studies.

Implications and Future Research

The results of this study add to the evidence base for using CTD to teach students with ID functional sight word recognition. The findings substantiate the need for implementing the appropriate intervention to support student success. Three out of four participants were able to recognize all target sight words as well generalize and maintain them for weeks after intervention. In light of the progress that the participants in this study and those in aforementioned studies made in a relatively short period of time, educators should be encouraged that most students have the potential to learn to read no matter the severity of their disability and should have opportunities to learn functional as well as higher literacy skills. Most noticeably, is

that it should be incumbent upon all educators to implement appropriate interventions for specific student populations as early as possible so that they do not loose valuable time in making measurable academic progress.

As suggested by the results of this study, individuals with significant and close to profound disabilities can learn to recognize functional sight words. This study was confined to a summer transitional program; however, three of the four participants made obvious progress in mean, level, trend, and latency criteria for experimental criterion. Based on their trend line established in this study, if they had continued in intervention with new word list, it seems that they could have learned to recognize many more words. Even the fourth participant, Steven was beginning to associate the words he saw with words he knew indicating that, with time, he may have learned the target words.

Furthermore, these were adult participants who were learning to read these basic words. The earlier literature discussed referencing brain development and the importance of matching the intervention with students' unique characteristics and needs may support student brain pathway development. These interventions can allow them to learn more when they need it the most (Burns, 2013; Cartwright, 2012). This being said, it is essential to ensure that students with significant intellectual disabilities have opportunities not only in resource and separate educational environments but also in inclusive school settings to learn functional and foundational early literacy skills. All educators must ensure that they are preparing future teachers to work with all students. No matter what a student's functioning level appears to be or, more importantly, what teachers believe a student's potential is, all students have potential and can learn. We owe it to these students to ensure they are being provided with appropriate instruction and interventions throughout the school day.

Also, the findings from this research suggest that students with significant intellectual disabilities can learn functional sight words within a short time frame. The participants in this study were only introduced to 10 target words. However, in reviewing the data, it is obvious that three of the participants were able to recognize 8 to 10 of the functional words within three to four data points or three to four days. Accordingly, these participants would likely have acquired many more words had they been given the opportunity to learn additional functional words. When comparing the results from this study with the results of the Allor et al (2014) study, this research suggest that students can learn functional sight words in an abbreviated time frame; while the Allor et al study suggested that it would take students with IQs in the 40-70 ranges from three to three and a-half years to increase in their word recognition. Admittedly, the interventions for these two studies were very different; therefore, further research needs to investigate what interventions work best to increase students' functional sight word recognition as well as other foundational literacy skills.

Another implication from this study suggest that students with varied IQ levels can make progress in learning functional sight words. Again, as the Allor et al (2014) study pointed out that students with varying IQs require different amounts of time to master a particular number of words, the authors also suggested that students with lower IQ scores sometimes outperform students with higher IQs. This was also realized in this present research in that Thomas who had an IQ of 41 outperformed Steven who had an IQ of 47. Future research should address the potential for students with lower IQ scores to attain functional reading skills just as quickly or more quickly than those higher IQ skills.

In the same vein, students with varying IQ levels also have varied disability diagnosis such as autism, intellectual disability, Down Syndrome, and/or dual disability diagnosis. This

research found that student with significant intellectual disabilities can learn to recognize words efficiently and effectively using a CTD intervention. Future studies should investigate students with varied disabilities in concurrent single subject multiple baseline designs to determine if a CTD would yield similar results with individual with different diagnosis.

Also, this research was implemented with participants with significant intellectual disabilities ranging in ages from 19-30. Grocery words were used with this population because the participants chose to learn words within this component of the curriculum. Their interest inventories revealed that they were interested in learning words that related to their experiences. The participants in this study made weekly trips to the grocery store and wanted to be able to locate and read items on their shopping list. More research is needed to investigate the results for younger populations with significant disabilities as early as kindergarten and preschool. Obviously, for this population, target words would be selected based on the needs of younger students but just as relevant to their lives (Burns, 2013).

Yet, another implication is that numerous word types could be used to support student increase in functional sight word as well as academic word recognition. For this research, participants chose the grocery words component of the *Edmark Reading Program* to learn. The findings suggest that the participants read these words quickly and were able to generalize them to other reading probes as well as maintain them over a six-week period. Future research should address students' ability to learn various types of words including functional and academic sight words using a CTD intervention.

In as much as the CTD intervention worked quickly for the participants in this study, it seems that this particular intervention had unique characteristics to address specific needs of students with significant intellectual disabilities. Future research should continue to add to the

literature for this research and other studies regarding the effectiveness of CTD as well as other time delay interventions in order to determine what works best with whom which is the reason for conducting single subject research in the first place.

One last important finding for the present study was that the behavior momentum component of the CTD intervention provided motivation for the students to preserve when either the task was too difficult or they would rather engage in something other than the task at hand. The behavior momentum also provided confidence for the participants to continue as they could identify most of the pictured objects. Future studies should investigate the addition of behavior momentum with reading and other academic interventions to determine if this component increases student correct responses for learning new information.

Finally, the literature from this and previous studies should provide options for educators to implement immediately in the classrooms. Although CTD can be embedded in both inclusive and resource room settings; takes little time; and can be implemented by trained teachers, other adults, and even peer students, the intervention must be carried out to fidelity to increase participant success.

Limitations

The limitations of this study are the small size and the very diverse nature and experiences of students with significant intellectual disabilities. Single subject research using a multiple baseline design allows for the investigation of what works within individual lives as well as what proves to be evidence based. Single subject is concerned with what actually improves quality of life, and to that end, this methodology provides essential information for educators and those working with individuals with disabilities. Also, researcher bias could be a limitation in that the researcher was also the instructor providing the intervention.

Conclusion

Students with intellectual disabilities have limited memory and cognitive load capacity, need explicit instruction, and deserve the same opportunities to respond to instruction as all other students. They deserve to be taught interventions that provide them access to their community and world. CTD is one intervention that is evidence-based for students with ID as well as other disabilities, has social validity, and can be implemented to fidelity without excessive demands on educators.

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APPENDIX A:

CONSTANT TIME DELAY: LETTERS/NUMBERS/SIGHT WORDS

Preparation. The set of upper- or lower-case letters, numbers, or sight words to be used in the session are written on the front of flashcards, one item per card.

Directions. The teacher opens each session with these instructions (adapted from Schuster et al., 1990): *I am going to show you cards with letters/numbers/words. If you know the letter/number/word, say it. If you don't know the letter/number/word, say nothing or say 'I don't know'.*

Phase 1: Teaching Sequence: No Delay. When first introducing the flashcard items, the teacher presents each item, provides the answer with a 0-second delay (i.e., no delay), and immediately prompts the student to provide the answer.

The teacher shows each card and says, *This letter/number/word is* [insert letter/number/word]. *What is this letter/number/word?*

If the student answers correctly, the teacher states, *Right. The letter/number/word is* [insert letter/number/word]. *Good job!* or similar feedback and praise. The teacher then advances to the next card.

If the student fails to respond or responds incorrectly, the teacher repeats the initial prompt: *This letter/number/word is* [insert letter/number/word]. *What is this letter/number/word?*

Phase 2: Practice Sequence: 5-Second Delay. Once the student has been introduced to all flashcards, the teacher institutes the 5-second-delay phase, which continues for the duration of the session.

The teacher shows each card and says, *What is this letter/number/word?*

If the student initiates a response within 5 seconds and answers correctly, the teacher states, *Right. The letter/number/word is* [insert letter/number/word]. *Good job!* or similar feedback and praise. The teacher then advances to the next card.

If the student hesitates longer than 5 seconds before responding or answers incorrectly, the teacher says, *This letter/number/word is* [insert letter/number/word]. *What is this letter/number/word?*

TAKEN FROM INTERVENTION CENTRAL
http://www.interventioncentral.org/instruction_constant_time_delay

APPENDIX B:

WORD LIST (MINUTES)

Note under session with a plus (+) if the word was read correctly unprompted (RCU) or read correctly prompted (RCP) or (-) if the word was read unprompted incorrectly (UPI), prompted incorrect (PI), or no response (NR) within the individual word trial. Minutes are only recorded for the entire session including the list of 12 words.

Start Time: _____ End Time: _____

Word List	Session Date WRC +/-
Margarine	
Bisquick	
Dishwashing Liquid	
Laundry Detergent	
Shaving Cream	
Deodorant	
Cucumber	
Sausage	
Cereal	
Frozen Dinner	
Tortilla Chips	

APPENDIX C:

DAILY PROBE FOR PROMPTING

Student: _____
Date: _____
Session: AM PM (Circle one)
Session: 1 2 3 4 (Circle one)
Session Location: _____
Instruction Provider _____
Inter-observer _____

Word List	Unprompted Correct	Prompted Correct	Unprompted Incorrect	Prompted Incorrect	No Response	Total
T. Chips						
Cereal						
Cucumber						
Shaving Cream						
Laundry Detergent						
Margarine						
Dish Detergent						
Bisquick						
Sandwich Bags						
Sausage						

APPENDIX D:

PARTICIPANT SURVEY

NAME: _____
DATE: _____ I agree I do not agree

1. Did the CTD sessions help you learn to recognize your new words?

   ___ ___ ___ ___ ___ ___

2. Do you think the teacher was too harsh?

   ___ ___ ___ ___ ___ ___

3. Do you think the CTD procedure could cause problems?

   ___ ___ ___ ___ ___ ___

4. Do you think there is a better way to teach sight words?

   ___ ___ ___ ___ ___ ___

5. Do you think CTD would be a good procedure to use with others?

   ___ ___ ___ ___ ___ ___

6. I like this method for teaching sight words.

   ___ ___ ___ ___ ___ ___

7. I think CTD can help students learn to recognize sight words.

   ___ ___ ___ ___ ___ ___

(Adapted from CIRP; Witt & Elliot, 1985.)

APPENDIX E:

TEACHER SURVEY

NAME: _____
DATE: _____

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I find this intervention to be effective for teaching functional sight words to students with ID/Autism?	_____	_____	_____	_____	_____
2. I would be willing to use This intervention to continue To teach functional sight words?	_____	_____	_____	_____	_____
3. I believe it would be appropriate to use this intervention without obtaining student consent?	_____	_____	_____	_____	_____
4. I like the use of this procedure?	_____	_____	_____	_____	_____
5. I believe the intervention effective?	_____	_____	_____	_____	_____
6. I believe this intervention will harm the student?	_____	_____	_____	_____	_____
7. I believe the intervention will improve word recognition?	_____	_____	_____	_____	_____
8. I believe that this intervention is effective for students who need support i n word recognition?	_____	_____	_____	_____	_____
9. Overall, I have a positive reaction to this intervention?	_____	_____	_____	_____	_____

(Kazdin, 1980; Kelley, Heffer, Gresham, & Elliot, 19

APPENDIX F:

PROCEDURAL CHECKLIST FOR INTER-OBSERVER RELIABILITY

Date: _____

Session: 1 2 3 4 (Circle one)

Session: AM PM (Circle one)

Procedures: Instructor: Yes/No

(a) presented a stimulus for each trial _____

(b) presented an active attending cue _____

(c) secured an active attending response _____

(d) presented correct discriminative stimulus _____

(e) awaited the appropriate delay interval _____

(f) delivered the correct controlling prompt and consequent event _____

(g) recording data during inter-trial interval _____

(Swain et al., 2015).

Researcher and Researcher Assistant Agreement (number of words marked correct prompted and unprompted)

Date_____
Baseline/Intervention

Number of words read correct unprompted

_____
Researcher

Number of words read correct unprompted. Number of words read correct prompted

_____ _____
Research Assistant

Agreements _____ Non-agreements_____

APPENDIX G:

CONSENT FORM

UNIVERSITY OF ALABAMA
HUMAN RESEARCH PROTECTION PROGRAM
Informed Consent for a Non-Medical Study

Study title: Using Constant Time Delay to Teach Functional Sight Words

Dear CrossingPoints Teacher:

You are being asked to take part in a research study. This study is called Using Constant Time Delay to Teach Functional Sight Words to Students with Significant Disabilities. I am Catherine Gilliam, a clinical instructor of Special Education at the University of Alabama.

What is the purpose of the study? What is the investigator trying to learn?
The purpose of this study is to add to the body of research in teaching functional sight words to students with significant disabilities. I hope to use the constant time delay procedure to support and enable youth with intellectual and other developmental disabilities to be successful in reaching their post-secondary goals beyond high school.

Investigator's Name, Position, Faculty or Student Status
Catherine Gilliam, clinical instructor and PhD student

Is the researcher being paid for this study?
The researcher is not being paid for this study.

Why is this study important or useful?
This knowledge is important/useful because I hope to learn a procedure for increasing sight word recognition for youth with intellectual and other developmental disabilities to increase their literacy skills and be able to be successful in reaching their post-secondary goals beyond high school.

Why have you been asked to be in this study?
You have been asked to be in this study because it is to determine an effective procedure for teaching recognition of functional sight words to enable youth with intellectual and other developmental disabilities to be able to be successful in reaching their post-secondary goals beyond high school. Because you teach in CrossingPoints Transition program and have some students who have expressed some desires in reaching specific post school goals where learning basic literacy skills is important, I am asking you to be in my study. This is a procedure that will

be implemented in the CrossingPoints Program with certain students, whether you agree to participate in the study related data or not.

How many people will be in this study?
There will be about 3 students asked to participate in this study and up to 3 teachers.

What will you be asked to do in this study?
If you agree to participate:

- I will work with you and the student in using the constant time delay procedure to teach functional sight words. While working with you and the student on this procedure, I will take notes and collect the data so I can use it to help other students similar to them in the future.

How much time will I spend being this study?
This study will take place over approximately two months. The procedure will be implemented within the regular school day and will not affect the student's participation in typical classroom/work activities in any way. This is a procedure that will be implemented in the CrossingPoints Program with certain students, whether you agree to participate in the study related data or not.

Will being in this study cost me anything?
No.

Will I be compensated for being in this study?
You will not be compensated for being in this study.

What are the risks (dangers or harms) to me if in this study?
There is no foreseen risk to you for participating in this study. The nature of the data collection ensures that there is no physical or psychological risk of any kind to you.

What are the benefits (good things) that may happen if I participate in this study?
There are no direct benefits to you, except learning about a new procedure that may benefit you and your students in the future.

How will my privacy be protected?
Your privacy will be protected through anonomyzing all data related to the study. In the event that the information collected is published in a professional journal, your privacy will be protected by referring to you only by pseudonym and/or using aggregated information based upon the responses of all the participants.

How will my confidentiality be protected?
The information/data you provide will be confidential. Only the researchers will know your identity. To protect the confidentiality of the participants, pseudonyms will be used in data and in the manuscript.
On completion of the study the results will be made available and explained to you. Results will be in aggregated form not specific to you.

What are my rights as a participant in this study?
Taking part in this study is voluntary. It is your free choice. You can refuse to be in it at all. If you start the study, you can stop at any time. There will be no adverse effect on your relations with the researchers or with the University of Alabama if you choose not to take part in the study.

The University of Alabama Institutional Review Board ("the IRB") is the committee that protects the rights of people in research studies. The IRB may review study records from time to time to be sure that people in research studies are being treated fairly and that the study is being carried out as planned.

Who do I call if I have questions or problems?
If you have questions about the study right now, please ask now or you may do so later by emailing me at cpgilliam@ua.edu.

If you have complaints or concerns about yours or your child's rights as a person in a research study, please call Ms. Tanta Myles, the Research Compliance Officer of the University, at 205-348-8461 or toll-free at 1-877-820-3066.

You may also ask questions, make suggestions, or file complaints and concerns through the IRB Outreach website at http://osp.ua.edu/site/PRCO_Welcome.html or email the Research Compliance office at participantoutreach@bama.ua.edu.

Teacher Signature _ Date _____
Researcher as witness _ Date_____