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UNIVERSITY OF CALIFORNIA  
RIVERSIDE

The Relative Effects of a Multicomponent Reading Intervention  
and Self-Monitoring Strategy on the Reading Comprehension and Engagement for  
Students With Autism: A Multiple Baseline With Alternating Treatments Study

A Dissertation submitted in partial satisfaction  
of the requirements for the degree of

Doctor of Philosophy

in

Education

by

Leslie Lyn Huscher

September 2022

Dissertation Committee:

Dr. Michael Solis, Chairperson

Dr. Wesley Sims

Dr. Austin Johnson

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2022

The Dissertation of Leslie Lyn Huscher is approved:

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Committee Chairperson

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Next, I would like to thank my family for their unconditional love, encouragement, and support. I am truly blessed to have a family that respected my vision and was willing to have an “absent” wife, mother, and grandmother as I dedicated myself to my studies and research. The greatest joy for me was their enthusiasm for my commitment and devotion to students with special needs.

As a general “shout out,” I would love to thank my entire staff at Big Springs Educational Therapy Center and School who took over many of my responsibilities as I diligently worked on my dissertation. I cannot thank them enough for maintaining the daily operations of the learning center and school.

Finally, I would like to thank God for placing it on my heart to serve children with a variety of learning disabilities, processing challenges, and autism. It has been my honor to provide the best education and support services possible for them to reach their maximum potential academically, socially, and emotionally.

## **Dedication**

I would like to dedicate this dissertation to all the students who struggle with learning, social, and behavioral challenges who do not feel they can achieve academically and struggle to belong and succeed in a traditional learning environment. I would like them to know they *are* someone special and worthy of an education which does not just pass them along, but expects them to succeed to the best of their unique abilities. I pray their voices are heard, and that specialists trained in their unique fields *hear* what they have to say, and truly listen to what they *need*.

## ABSTRACT OF THE DISSERTATION

The Relative Effects of a Multicomponent Reading Intervention and Self-Monitoring Strategy on the Reading Comprehension and Engagement for Students With Autism: An Alternating Treatments Study With a Baseline Phase

by

Leslie Lyn Huscher

Doctor of Philosophy, Graduate Program in Education  
University of California, Riverside, September 2022  
Dr. Michael Solis, Chairperson

Over the past several years, the need for identification and implementation of effective reading comprehension strategies for students diagnosed with autism spectrum disorder (ASD) has come to the forefront of educational research, especially as the prevalence of this population continues to rise. It has been well documented, a large percentage of students with ASD demonstrate stronger decoding and word recognition skills over comprehension of text and are chronically disengaged from non-preferred, academic tasks. Additionally, this population demonstrates reduced ability to self-monitor their behavior in order to stay engaged with academic tasks, which impacts performance despite their learning potential. This alternating treatments with baseline phase, single-case design study investigated the effects of implementing a main-idea summarization reading intervention to the same reading intervention paired with a self-monitoring strategy. Outcomes of reading comprehension and engaged behavior were assessed daily for three students diagnosed with ASD in grades 5-8. Subjects were selected based upon their grade, eligibility of ASD, cognitive functioning (standard score

>85), and reduced comprehension skills based upon IEP goals and/or standardized assessment. The participants will receive individual intervention within 30 minute sessions per day, four days per week, for four consecutive weeks. After the baseline is established, the alternating treatment conditions will consist of reading intervention only and reading intervention plus a self-monitoring strategy on both reading comprehension and on-task engagement. Daily comprehension rubrics and self-monitoring charts will be collected and visually inspected along with videotaped recordings of student engagement using the Behavioral Observation of Students in Schools (BOSS) form, which records percentage of intervals in which targeted behaviors occur. Social and fidelity of implementation will also be measured using exit surveys and daily checklists.



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## CHAPTER 1

### INTRODUCTION

As the prevalence rate of children identified with autism spectrum disorder (ASD) continues to increase, it is imperative that educators design and implement effective practices and behavioral supports within the classroom setting (Callahan & Rademacher, 1999; Kahot, Masi, & Segal, 2003; L. K. Koegel, Harrower, & Koegel, 1999; Kunce, 2003; Wilkinson, 2008). Students with ASD receive instruction in a variety of environments and programs; therefore, it is important for all teachers to be equipped with the skills necessary to provide high quality instruction while meeting the individual and diverse needs of this student population (McKinney, Simpson, & Rose, 2013).

According to the American Psychiatric Association (APA, 2013), autism is a pervasive developmental disorder marked by differences in the areas of communication, socialization, and repetitive behavior. According to Lord et al. (2005), students with autism display varying degrees of difference in each of these areas. Due to these variations, students diagnosed with ASD struggle to engage in social communication interactions with peers and adults, initiate and maintain attention to activities, and process information from their environment (Rao & Gagie, 2006), which may lead to less time on task and low engagement when presented with academic instruction (Carnahan, Musti-Rao, & Bailey, 2009).

Autism is a complex information processing disorder and impairs a broad range of intellectual skills. According to Chakrabarti and Fombonne (2005), approximately 70% of individuals with ASD are thought to have learning aptitude within the average to

above average range. However, reading comprehension has been identified as the most prevalent area of weakness in academic achievement of students with ASD (Jones et al., 2009). Students may struggle with integrating information from previous text to help them understand ideas from the text they are currently reading (Woolley, 2016). More recent studies report that some students with ASD have stronger word reading and factual recall but struggle with reading comprehension (Brown et al., 2013; Henderson et al., 2014; Huemer & Mann, 2010; Jones et al., 2009; Newman et al., 2007). Weaknesses in comprehension for students with ASD are reported to be attributed to inability to relate to characters, struggles to integrate and synthesize information, and deficits in social communication (Williamson, et al., 2012). These authors go on to state that students with ASD tend to hyperfocus on frequently insignificant details rather than grasping the gestalt of the given text.

Five essential components have been identified as key predictors of proficient readers: phonological awareness, phonics, vocabulary development, fluency, and comprehension (National Reading Panel Report, 2000). Of these subskills, reading for understanding is an essential skill for most learning tasks, especially as students increase in grades and independent functioning in life (Klingner, Vaughn, & Boardman, 2015; Solis et al., 2011). To achieve true comprehension, readers must go beyond the level of the clause, integrating phrases and sentences to synthesize a representation of main ideas (Chiang & Lin, 2007; Kintsch, 1998; Pressley & Afflerbach, 1995; Whitney & Budd, 1996). Williamson, et al. (2012) further added that both textual factors (e.g., length of words and sentences within the passage, genre, picture support) and reader factors (e.g.,

perspective taking, literal versus concrete thinking, executive functioning) influence the reading comprehension process for this population.

Not only does a small yet growing body of research support the use of research-based reading interventions and behavioral strategies for students with ASD, legislation necessitates the use of such practices (Yell & Bateman, 2017). Based upon three prominent legislative acts, schools are required to apply evidenced-based teaching methodology and curricula to all students with and without exceptionalities. The No Child Left Behind Act (2001), Individuals with Disabilities Educational Act (2004), and the recent ruling by the Supreme Court Act (Yell & Bateman, 2017) require school personnel to provide students with disabilities access to the general education curriculum and interventions to address deficits in core academic areas such as reading. With a unanimous decision, the Supreme Court ruled in 2017 that school districts must “aim to enable students to make academic and functional progress in light of their circumstances.” Specifically, Justice Roberts stated, “...a student offered an educational program providing merely more than *de minimus* progress from year to year can hardly be said to have been offered an education at all.” Based upon these three key acts, it is imperative that educators working with students with disabilities determine effective strategies for students who are not responding to current evidenced-based practices, including students with low incidence disabilities (e.g., ASD) (Vaughn & Fletcher, 2012).

### **Reader Profile Studies of ASD**

Current research has improved the field’s understanding of reader profiles for students with ASD (Fleury et al., 2014; McIntyre et al., 2017; Nation et al., 2006). Nation



et al., (2006) investigated four components of reading: word recognition, nonword decoding, text reading accuracy, and text comprehension with a sample of students with ASD (N = 41) between the ages of 6 and 15 years old. Findings demonstrated the heterogeneous nature of performance. Some students had word reading and reading comprehension problems and other students only had problems with comprehension. They determined that reading is not a “unitary construct” and may not follow a typical developmental sequence for this population. Therefore, it is important to not only consider but understand each student’s underlying deficits in reading comprehension in order to develop appropriate intervention strategies (Nation et al., 2006; O’Conner & Klein, 2014).

Fleury et al. (2014) reviewed how characteristics associated with ASD can impact academic performance and overall academic profiles of students with ASD. Findings suggest that diminished Executive Functioning (EF) and Weak Central Coherence (WCC) can negatively impact this population. EF and WCC processes such as behavioral regulation (e.g., inhibition, attention to task) and metacognition (management of self and tasks) influence a student’s ability to plan multistep sequences of events, demonstrate mental flexibility, reflect, and reason. Fleury et al. (2014) suggested the intervention approaches of self-monitoring and graphic organizers could be implemented to support these deficits associated with EF and WCC. Use of self-monitoring strategies aid the student’s ability to reduce the need for adult facilitation and feedback, and graphic organizers allow the student to move from “bottom up” (detail oriented) to “top down” processing (gestalt or big picture).

McIntyre et al. (2017) investigated the reading profiles of students with higher functioning autism spectrum disorder (HFASD) with a sample population (N = 81) between the ages of 8 and 16 years old. Findings reported four distinct reading profiles for this population: (a) readers with comprehension disturbance (poor comprehension or hyperlexic reading disability with good vocabulary); (b) readers with global disturbance (mixed reading disability as they struggle with phonology, vocabulary, and linguistic comprehension); (c) readers with severe global disturbance (struggle with phonology, vocabulary, and linguistic comprehension to a more marked degree); and (d) average readers (intact reading skills). Despite the recent findings of reader profile studies for students with ASD, many students on the spectrum still receive the same remedial reading instruction as typically developing students (Carnahan, et al., 2009; Woolley, 2016).

### **Reading Comprehension Intervention Research and ASD**

Over the past 25 years, the need for identification and implementation of effective reading comprehension instructional strategies for students with ASD has come to the forefront of educational research, especially under consideration of policy initiatives and recommendations from the Common Core Standards (Common Core State Standards Initiative, 2010). More specifically, researchers continue to investigate and identify evidenced-based practices (EBPs) with empirical evidence supporting improved outcomes for unique groups of students such as those with ASD (Finnegan & Mazin, 2016). However, the studies in this body of literature have study designs and sample sizes which limit the validation of EBPs for students with ASD in the area of reading

comprehension to date. Thus, researchers typically rely on EBPs identified for other populations of students with reading difficulties for guidance (Scammacca et al., 2015). This guidance suggests that the majority of reading comprehension strategies proven effective with neurotypical students have also resulted in improved outcomes for students with ASD (Browder et al., 2006).

### **Reading Comprehension and Cognitive Processing for Students with ASD**

Many students with ASD in the average and higher end of the spectrum have adequate decoding skills and also have a wide range of differences with cognitive processing (executive functioning, weak central coherence) that might impact their reading comprehension (Brown, Oram-Cardy, & Johnson, 2013; El Zein, Solis, Vaughn, & McCulley, 2013; Henderson, Clarke, & Snowling, 2011; Ricketts, et al., 2012; Woolley, 2016). Executive function deficits include reduced processing speed, inability to focus on relevant information, attention shifting, and challenges with organizational memory. Weak central coherence deficits include ability to integrate information from text as well as background knowledge for inference generation (Norbury and Nation, 2011) and global comprehension (Ricketts et al., 2013). Additionally, students with ASD demonstrate reduced ability to monitor their own thoughts and actions during a learning task when compared to their neurotypical peers (Douglas, et al., 2011; Oliveras-Rentas et al., 2012; Williamson, Carnahan, & Jacobs, 2012; Woolley, 2016). Therefore, to increase their comprehension skills, this population requires well-organized, structured, and differentiated instructional approach that encourages active engagement and achievement

using multiple instructional strategies (Chiang & Lin, 2007; El Zien et al., 2013; Mirinda, 2003; Senokossoff, 2015; Vanlaar et al., 2013; Woolley, 2016).

### **Issues of Engagement for Students with ASD**

Within general education classrooms, the relationship between learning and academic engaged time is strong according to evidence from the literature (Cancelli, Harris, Friedman, & Yoshida, 1993; Curry, 1984; Greenwood, Horton, & Utley, 2002; Nystrand & Gamoran, 1989).

Active engagement has been positively correlated with better outcomes for students with and without exceptionalities (Carnahan et al., 2009; Iovanne, Dunlop, Huber, & Kincaide, 2003; Roberts, et al., 2019). Carnahan et al. (2009) noted that active engagement has been defined using a variety of terms and key behavioral characteristics. Specific behaviors such as attention toward the teacher (Greenwood, Horton, & Utley, 2002), involvement in learning tasks (Skinner & Belmont, 1993), and initiating activities when given the opportunity (Klem & Connell, 2004) have been used to describe this behavior.

Specifically, for the ASD population, active engagement has been defined as on-task and on-schedule behavior (Bryan & Gast, 2000; MacDuff, Krantz, & McClannahan, 1993; Pelios, MacDuff, & Axelrod, 2003). Within a classroom setting, active engagement is described using a variety of specific observable behaviors. Connell & Wellborn (2004) identified two forms of specific engagement: ongoing engagement and reaction to challenge. They described ongoing engagement relating to student behavior, emotions, and general thought processes. They operationalized behavioral engagement (reaction to

challenge) as time students spent on work, intensity of concentration and effort, tendency to stay on task, and propensity to initiate action when given the opportunity.

Although student engagement during academic tasks is positively associated with academic achievement among school-age children with ASD (Koegel et al., 2003, 2010; Roberts, et al., 2019), this population often exhibits low levels of academic engagement (Dunlap, 1999). Students with ASD who have low levels of engagement appear to improve engagement and time on task from self-monitoring interventions (Carr et al., 2014; de Bruin et al., 2013; Roberts et al., 2019).

### **Self-Monitoring and Academic Outcomes for Students with ASD**

Use of self-monitoring strategies (also known as self-management) has proven to be effective in gaining increased attention, academic productivity and accuracy, reading comprehension, and on-task behavior for students with learning disabilities and behavioral disorders (Clees, 1994; Holifield, et al., 2010; Maag, & DiGangi, 1993; Reid, 1996). Self-monitoring is defined as a procedure that requires students to systematically monitor their own behavior in order to assess whether or not a targeted behavior has occurred and then record the result in some manner (Holifield et al., 2010; Koegel, Koegel, & Parks, 1995; Odom et al., 2003; O'Reilly, et al., 2002; Prater, et al., 1991; Todd & Reid, 2006; Wilkinson, 2008). Two common types of self-monitoring strategies have been identified within the literature: self-monitoring of attention and self-monitoring of performance (Harris et al., 2005; Holifield, 2010; Reid, 1996; Reid & Harris, 1993). Use of self-monitoring of attention procedures aim to increase active engagement time, which is also referred to as on-task behavior (Akande, 1997; DiGangi, Maag, &

Rutherford, 1991). Use of self-monitoring of performance strategies target increasing academic performance (Dunlap & Dunlap, 1989; Harris et al. 2005; Holifield, 2010).

Researchers have reported improved outcomes for students with ASD within the classroom setting using self-monitoring strategies. Based upon the work of Myles & Simpson (2003), self-monitoring increases independence, self-reliance, and responsibility and “buy-in” for their own behavior while decreasing dependence on external control and incessant supervision. Self-monitoring is considered to be critical in generalizing adaptive behavior, encouraging autonomy, and producing sweeping behavioral improvements across various environments for many children with ASD (R.L. Koegel, et al., 1999; Leet et al., 2007).

### **Study Purpose**

The purpose of this study was to evaluate the efficacy of using self-monitoring paired with reading intervention strategies to support improved outcomes for students with ASD. Explicitly, this study will evaluate an intervention to answer the following research questions:

- 1) *How effective is use of self-regulation plus reading intervention on improving academic outcomes for students with ASD when compared with a reading intervention only treatment?*
- 2) *How effective is use of self-regulation plus reading intervention on increasing levels of on-task behavior for students with ASD when compared with a reading intervention only treatment?*

## CHAPTER II

### LITERATURE REVIEW

The purpose of this chapter is to review the literature of empirical studies of reading interventions and self-monitoring for students with ASD on reading comprehension and student engagement. Due to the small number of studies conducted on the effects of self-monitoring interventions on academic engagement and achievement for students with ASD (Carr et al., 2014; de Bruin et al., 2013; Roberts et al., 2019), a synthesis of syntheses of articles including alternate, but similar, populations will be conducted. These populations include at-risk learners, learning disabilities (LD) and attention deficit disorder (ADD). Emotional and intellectually disabled students were excluded from this review as these populations are not the focus of this study. See Table 2.1 for a list of systematic and meta-analysis studies reviewed. A review of more recent literature was also conducted. Within these systematic reviews, studies were located that investigated treatments that included both reading comprehension and self-monitoring interventions.

First, the procedure for coding the located studies is described. Next, a summary of the systematic reviews for alternate populations is provided followed by specific findings from the located studies of similar populations are reported. Following this, a review of more recent literature was conducted to capture more current studies that might not have been included in the reviewed syntheses. Finally, a second synthesis of syntheses was conducted of reading and self-monitoring interventions for students with ASD followed by a more recent review of literature to capture and summarize findings of

more recent studies employing treatments including reading comprehension plus self-monitoring utilizing samples of students with ASD.

A criterion was developed to determine which research studies to select for this synthesis. A systematic procedure was utilized to ensure that all the possible combinations of descriptors were attempted within the selected databases. Studies were included if they met the following criteria: (a) included self-monitoring intervention paired with or without reading intervention as the independent variable(s), (b) included academic engagement time and/or achievement as the dependent variable(s), (c) excluded intellectually or emotionally disturbed participants, (d) included students in K-12, (e) included students with ASD, ADHD, LD, or at-risk learners, (f) occurred during regular school hours, (g) published in a peer reviewed journal from 1985 to 2021, (h) was an experimental, quasi-experimental, or single case design, and (i) studies that were conducted and reported in English.

First, a computer-assisted search was conducted to discover relevant literature. A search of Google Scholar, PsychINFO, and Educational Resources Information Center (ERIC) with the following key terms was performed: autism, high functioning autism, learning disabilities, time on task, reading comprehension, academic engagement, academic intervention, on-task behaviors, academic instruction, self-monitoring, self-regulation, and engagement. After a computer-based search was completed, a physical review of the reference pages for each article was conducted in order to discover additional studies. After completion of this search, 30 articles were selected for this literature review.



Data was collected and coded from each article in the following areas: (a) research design, (b) number of participants, (c) grade/age, (d) primary disability, (e) independent variable(s), (f) dependent variable(s), and (g) measurement results of dependent variable(s).

Based upon the What Works Clearinghouse (WWC) (IES, 2015), single-case design studies need to meet the following criteria in order to meet the highest degree of confidence without reservation: (a) systematic manipulation of the independent variable, (b) graphical illustration of evidence, (c) at least three attempts with sufficient data points to evaluate the demonstration of an intervention effect, (d) eligible outcomes that meet WWC requirements, and (e) measures of effectiveness can be attributed solely to the intervention.

Percentage of nonoverlapping data (PND) was conducted through visual analysis of provided line graphs and/or data reported within each study. Treatment effectiveness was calculated based on the percentage of PND, representing the proportion of data points in the baseline phase that overlapped with any of the data points in a comparison phase. The total number of treatment sessions is divided by the number of data points above the highest baseline point (Scruggs & Mastropieri, 1998). Level of effects are interpreted as follows: (a) very effective treatment with 90 to 100% data points above baseline, (b) effective treatment with 70 to 89% data points above baseline, (c) questionable treatment with 50 to 69% data points above baseline, and (d) ineffective with below 50% data points above baseline (Scruggs & Mastropieri, 1998; Wolery et al., 2010). Effect sizes were provided by NicholSEN et al. (2010), even though this is not

typically reported for single case design research (Roberts et al., 2014). A common measure of effect size is Cohen's *d*. Based upon this measure, 0.2 should be considered a small effect size, 0.5 represents a medium effect size, and 0.8 or greater is a large effect size.

### **Synthesis of Syntheses- Reading Interventions and Self-monitoring for At-risk Readers, LD, and ADD**

In response to educational reform and policies requiring the use of evidence-based practices, there is a need to understand how research can inform and improve reading comprehension instructional practices for students with reading challenges and learning disabilities (Solis, et al., 2013). One way to achieve this goal is to conduct thorough, descriptive, systematic reviews of past literature to ascertain the effectiveness of reading comprehension interventions for these populations (Williamson, Carnahan, & Jacob, 2012; Solis, et al., 2013.). Five systematic literature reviews were located and synthesized which targeted the effectiveness of self-monitoring and reading intervention on engagement and/or reading comprehension for students with reading difficulties, disabilities, and/or ADD in grades K-12 between the years of 1979-2011 (Joseph & Eveleigh, 2011; Scammaca et al., 2007; Scammaca et al., 2015; Solis et al., 2015; Wanzek et al., 2009). See Table 2.1 for a brief description of each synthesis. Out of the 113 studies collectively represented by these reviews, only nine met selection criteria for this current review. First, a brief description of each systematic review will be provided, then a list of relevant studies for this current review will be provided.

### ***Description and Purpose of Systematic Reviews***

Wanzek, Wexler, Vaughn, & Ciullo (2009) conducted a synthesis of research on reading interventions for students with reading difficulties and disabilities in grades 4-5 between the years of 1988-2007. Overall, the authors found large effect sizes for studies focusing on reading comprehension on researcher-developed measures. A total of 24 studies were located, and 13 of them utilized treatment/comparison designs and 11 included single group or single subject designs. Of these 24 studies, eleven implemented interventions with comprehension as the dependent variable. Of these eleven studies, two included a self-monitoring strategy.

Joseph & Eveleigh (2011) and Solis et al. (2012) conducted two similar but separate comprehensive reviews. Based upon their findings, the authors determined use of self-monitoring and reading intervention strategies improved reading comprehension for students with reading challenges, disabilities, and ADD based upon effect sizes and PND.

Joseph & Eveleigh (2011) conducted a review to synthesize the effects of self-monitoring methods on reading achievement for students in grades 2-8 with disabilities, including behavioral disorders, between the years of 1987-2008. 16 studies met inclusion criteria, and the authors stratified the studies into five categories: self-recorded accuracy levels on responding to reading comprehension questions; self-recorded productivity levels on responding to reading comprehension questions; self-recorded main idea/summarization generation; self-recorded oral reading performance; and self-recorded on-task behavior during reading tasks. Of these 16 studies, some were excluded

from this review as the participants were primarily diagnosed with behavioral disorders (n = 2) or the dependent variable was oral reading performances (n = 5). The remaining studies measured the impact of reading intervention and self-monitoring on comprehension for students with LD and/or ADD, and two also included student engagement as a dependent variable.

Solis et al. (2012) conducted a 30-year synthesis of research relating to reading comprehension interventions for middle school students in grades 6-8 with identified learning disabilities. Based upon these comprehensive reviews of experimental, quasi-experimental, and single-participant design studies (which included reading comprehension as the dependent variable), researchers found a total of 14 studies which met inclusionary criteria. Based upon these 14 studies, treatment conditions were stratified into four sections: summarization-main idea, summarization-main idea paired with self-monitoring, multiple strategy interventions, and other treatments. For the purpose of this current review, summarization-main idea paired with self-monitoring studies will be discussed.

Scammacca et al. (2015) conducted a meta-analysis of reading interventions for struggling readers in grades 4-12 between 1980-2011. The purpose of this meta-analysis was to update and replicate their first review, which took place in 2007. Based upon this exhaustive review of experimental and quasi-experimental treatment-comparison or multiple-treatment comparison designs, 36 publications met inclusion criteria. Based upon the results of this in-depth analysis, Scammacca, et al. (2015) determined reading interventions for students in grades 4-12 to be effective on measures of comprehension.

However, the researchers reported a significant drop in mean effect sizes (0.95 to 0.49) and standardized measures (0.42 to 0.21) for studies published after 2005. The authors attributed this drop to an increased use of standardized measures, more rigorous and complex research designs, and stronger “business as usual” reading programs implemented to all students, which served as control groups.

Combining the results of these five systematic reviews, seven experimental studies (Boyle, 1996; Graves & Levin, 1989; Jitendra, Hoppes, & Xin, 2000; Malone & Mastropieri, 1992; Manset-Williamson & Nelson, 2005; Mason, et al., 2006; Wong & Jones, 1982) and two single-participant studies (Gardill & Jitendra, 1999; Jitendra et al., 1998) were discovered. All nine studies encompassed some form of reading intervention and/or self-monitoring (checklists, forms, cue cards, story maps, question generation, and interactive images) on reading comprehension and/or engagement. All nine studies reported medium to large effect sizes. See Table 2.2 for a summary of treatment-comparison and single-subject study features.

In an effort to capture all of the pertinent studies, a review of the literature of more recent studies was conducted. Seven additional studies employing samples other than ASD were ascertained through the computer search of peer reviewed articles which addressed some aspect of self-monitoring and/or reading intervention on comprehension and/or engagement between the years of 1995 through 2021 (Berkely et al., 2011; Bruhn & Watt, 2012; Edwards et al., 1995; Harris et al., 2005; Rock, 2005; Shimabukuro et al., 1999; Taylor et al., 2002). Of these seven studies, one was experimental and six were single case design.

Review of these 16 studies will be described across four distinct but similar categories: self-monitoring intervention on engagement, self-monitoring intervention on engagement and reading comprehension, self-monitoring and reading intervention on engagement, and self-monitoring and reading intervention on reading comprehension. No studies were found which evaluated self-monitoring and reading intervention on reading comprehension and engagement for these targeted populations.

**Self-monitoring Intervention on Engagement.** Two studies focused on the use of a self-monitoring strategy on engagement (Harries et al., 2005; Rock, 2005). Harris et al. (2005) set out to determine the effects of using self-monitoring of attention versus self-monitoring of performance on engagement behavior and academic performance (spelling) for students with ADHD. However, for the purpose of this current study only engagement will be reviewed. A counterbalanced, multiple-baseline, across-subjects design was implemented and the study took place within a language arts general education classroom. Students who qualified for Special Education Services received instruction within a general education classroom using an inclusion model. Six participants were chosen in grades 3-8, and all were diagnosed with ADHD by a physician, a neurologist, or a psychologist.

On-task behavior was operationally defined as a student: (a) focused their eyes on the spelling list, practice paper, or self-monitoring tally sheet; (b) executed any step in the spelling study procedure; or (c) asked for help. Interobserver agreement between the second trained observer and the classroom teacher was found to be 95% or better prior to the onset of the study and remained strong throughout all phases of the experiment.

Participants were observed individually on a rotating basis using a momentary time sampling (3 seconds). Each student's behavior (on or off-task) was recorded 50 times per session. To control for possible confounding effects of social reinforcement, neither the teacher or aide interacted with the students unless specifically requested.

Students were taught the strategies of self-monitoring of attention (SMA). For the SMA condition, students listened to random tones through headphones (average interval 45 seconds) while studying their weekly spelling lists. On their individual tally sheets after hearing the tone, the students marked "yes" if they were paying attention and "no" if they were not on-task. At the end of the session, students graphed how many "yes" marks they achieved for the day.

Based upon the results of their study, Harris et al. (2005) found strong effect sizes for self-monitoring of attention (PND =100%, 100%, 100%, 67%, 80%, 100%) for all six students. Upon completion of the study, students completed an exit interview. Five out the six students reported negative feedback for SMA (beeps were distracting, it was boring, and checking on-task behavior prevented them from working).

Rock (2005) examined the effects of implementing a strategic self-monitoring intervention (ACT-REACT) on the academic engagement (math and reading), nontargeted problem behavior, productivity when completing seatwork, and accuracy of students with and without disabilities. However, for the purpose of this current review only engagement will be reviewed as productivity and accuracy data were not recorded during reading instruction due to varied curriculum and measurement difficulties. The ACT-REACT strategy is a combined self-monitoring of performance (SMP) and

attention (SMA). A multiple-baseline-across-subjects design with an embedded reversal was implemented. The purpose of this intervention was to support students who are chronically disengaged from academic tasks in taking responsibility for their own learning.

Nine participants were chosen in grades 2-5 and placed into three groups. The students qualified for Special Education Services under the following categories: AS, GATE, Floating Harbor Syndrome (FHS) with SLI, LD with ADHD, LD, LD with SLI, typically developing, and ADHD. For Group 1, academic disengagement (student not in seat or not working quietly on paper) was recorded using frequency counts. For Groups 2 and 3, academic engagement data (student in seat, working quietly on paper-pencil task) was recorded using a momentary time-sampling at one-minute intervals. IOAs were conducted throughout each phase of the study between all four observers. The mean score for academically disengaged behavior was 89% for Group 1. Academically engaged time was 95% for Group 2 and 90.3% for Group 3.

ACT-REACT is a strategy which makes use of a mnemonic device designed to represent a six-step, combined SMA + SMP strategy. The six steps include the following: Articulate your goals, Create a work plan, Take pictures, Reflect using self-talk, Evaluate your progress, and ACT again. Students received explicit instruction and modeling for each step and that the strategy was recursive (continuous rather intermittent/random).

Rock (2005) reported 100% PND for all students except one, who received a combined PND score of 75% over treatment one and two, which is still considered to be an effective treatment based upon WWC. Overall, the author concluded that the ACT-



REACT self-monitoring intervention was effective in increasing academic engagement in students with and without exceptionalities within inclusive classrooms. Additionally, the implementation of this procedure maintained over time, which is promising.

### **Self-monitoring Intervention on Engagement and Reading Comprehension.**

Two studies evaluated the use of self-monitoring on both engagement and comprehension (Edwards et al., 1995; Shimabukuro et al., 1999). Edwards et al. (1995) investigated the effectiveness of a self-monitoring strategy on engagement and reading comprehension for three male participants medically diagnosed with ADHD in grades 3-4. They all received 30-60 minutes of language arts instruction within the school's resource room.

An ABABC with follow-up single subject design was implemented over 52 sessions. The study contained the following stages: Baseline 1, Self-Management, Baseline 2, Self-Management + Fading, and Follow-Up.

After receiving five days of training, students were asked to listen to random interval tone prompts during 20 minutes of reading instruction (average one per minute) and record their engagement using a card placed on their desk. Reading comprehension was assessed by having the students read passages and short stories and then respond to 10 questions presented in the form of cloze passages or sequencing activities. Increased engagement and comprehension accuracy was rewarded with points which could be exchanged for preferred activities and reinforcers (token system).

Overall, the authors found increased engagement and comprehension for all three participants when using a self-monitoring strategy paired with a token system.

Engagement increased by an average of 37% from Baseline 1 to Self-monitoring +

Fading. Although comprehension accuracy proved to be more inconsistent, the authors noted this finding could be explained by student interest, variability in maturity and self-esteem, and the number of sessions completed. The authors reported the following average accuracy scores at Baseline 1, Self-Management, Baseline 2, Self-monitoring + Fading, and Follow-up for Subjects 1, 2, and 3, consecutively: 10%, 52%, 21%, 38%, 40; 19%, 57.3%, 40%, 58.6%, 55%; 33%, 79.3%, 49%, 72%, 75%.

At the end of the study, students reported that they liked the self-monitoring strategy as it increased their productivity, accuracy, and earning rewards. However, they did not like the sequencing comprehension activities because they were harder than the cloze passages.

Shimabukuro et al. (1999) studied the effectiveness of self-monitoring of academic productivity and accuracy on the academic performance and engagement of students with exceptionalities. A single-group, multiple baseline design across three academic areas was used to ascertain the effectiveness of the intervention. Three male participants were selected for the study, one sixth grader and two seventh graders. All participants exhibited average intelligence, were identified as having a learning disability, were medically diagnosed with ADD/ADHD, capable of performing academic tasks during instruction and independent work, and had a history of academic deficiencies and problematic attentional behaviors during academic tasks.

The study took place in a mixed 6-8 grade, self-contained classroom at a private school for students with learning disabilities. Although the study was implemented during reading, mathematics, and written expression, for the purpose of this current review, only

reading will be discussed. Three dependent variables were identified by the authors: academic accuracy, academic productivity, and on-task behavior. Students monitored their academic accuracy and productivity, and the teacher was responsible for observing and keeping track of students' on-task behavior. Academic accuracy was self-corrected by students each day based upon their work samples and scores were expressed as percentages. Academic productivity was measured by students counting the number of items completed compared to the number of items assigned and scores were reported as percentages. On-task behavior was recorded using a 10-second time interval on a rotational basis for each participant. On-task behavior was defined by the following observable behaviors: (a) seated at own seat; (b) writing supplies and work materials on desk in front of the student; (c) eyes on teacher, board, or own work; (d) reading or working on assignment; and (e) asking appropriate, relevant questions of teacher or neighbor.

Procedures adhered to throughout the experiment included data collection, interobserver reliability (IOA), instruction of self-monitoring, and accuracy of student self-monitoring. Baseline consisted of four days for each participant where use of self-monitoring was absent. Data was collected by the team in terms of academic accuracy, productivity, and on-task behavior. IOAs were conducted every fourth day of the study and ranged from 86% to 100% ( $M = 94\%$ ).

Based upon the results of the study, Shimabukuro et al. (1999) reported self-monitoring of academic performance yielded greater positive effects for productivity (PND = 100%, 100%, 100%) than for accuracy of reading comprehension (100%, 96%,

92%), although both conditions proved to be statistically significant. The authors concluded that self-monitoring of academic performance could result in increased academic productivity and accuracy. Additionally, on-task behavior for students with exceptionalities could improve when engaged in independent class work.

**Self-monitoring and Reading Intervention on Engagement.** One study was located which focused on SM + RI on student engagement. Bruhn & Watt (2012) conducted a study which examined the effects of integrating a multicomponent self-monitoring strategy within a reading support classroom using an ABAB withdrawal single-case design on decreasing disruptive behavior and increasing engagement over 17 sessions. However, for the purpose of this study only the self-monitoring and reading intervention on engagement will be discussed. Two girls in grades 7 and 8 participated in the study. One was identified with ADHD with behavioral challenges and received Special Education Services, and one was neurotypical with identified behavioral challenges. The study took place in a small classroom containing a total of 14 students over 90-minute sessions using READ 180, which is an intervention with a highly structured instructional model including three components: whole group instruction, small-group rotations, and whole-group wrap-up.

Academic engagement was defined as (a) attending to the teacher-assigned task, (b) eyes oriented toward the teacher during instruction and directions, (c) working on the assigned task, (d) using materials appropriately, (e) asking for teacher help appropriately, and (f) interacting with the teacher or peers about appropriate academic topics. During the intervention phase, both participants continued to receive the same reading instruction

but they were asked to fill out a self-monitoring form at the end of each rotation. The students rated themselves on achieving classroom expectations, teacher feedback, and contingent reinforcement using a four-point Likert- scale (2 = all of the time, 1 = some of the time, 0 = none of the time, n/a = not applicable).

Based upon visual inspection of graphs provided and the authors' narrative, both participants increased overall academic engagement time. Participant 1 achieved 100% PND from baseline to intervention and evidenced a clear and instant change in level, trend, and stability (range = 88.3%-100%). Participant 2 achieved 80% PND from baseline to intervention and also evidenced an immediate increase in level, trend, and stability (range = 66.7% to 91.7%).

Overall, the authors concluded the multi-component self-monitoring strategy paired with the READ-180 intervention improved academic engagement for both participants. Additionally, strong social validity was reported for ease of use, appropriateness, and lack of reduced instructional time for both teacher and participants.

**Self-monitoring and Reading Intervention on Reading Comprehension.** Nine studies evaluated the impact of a reading intervention and a self-monitoring strategy on reading comprehension (Boyle, 1996; Gardill & Jitendra, 1999; Graves & Levin, 1989; Jitendra et al., 1998; Jitendra, Happs, & Xin, 2000; Malone & Mastropieri, 1992; Mason et al., 2006; Taylor, Alber, & Walker, 2002; Wong & Jones, 1982) and two measured the impact of reading intervention and self-monitoring with a transfer of using reading strategies from teacher to student (Berkeley, Mastropieri, & Scruggs, 2011; Manset-Williamson & Nelson, 2005).

Three studies used check-lists as a self-monitoring tool. Graves & Levin (1989) designed an experimental study which investigated two treatments (self-questioning paired with self-monitoring versus use of a mnemonic device) when identifying the main idea of given passages. The researchers found that both treatments outperformed the comparison condition. However, they also determined that the main idea condition proved to be more effective than use of a mnemonic condition ( $ES = 1.13$ ).

Malone and Mastropieri (1992) implemented three treatment conditions (summarization training, summarization training with a self-monitoring component, and traditional instruction) for 45 middle-school students with LD using randomized assignment. The authors found that students using summarization with self-monitoring (check-list card) outperformed control group participants ( $MES = 1.87$ ). Additionally, students in the summarization with self-monitoring condition outperformed students in the summarization only condition ( $MES = 0.35$ ).

Wong and Jones (1982) conducted a study to determine the impact of using a self-questioning technique on main idea comprehension for 60 LD students in grades 8-9, and 60 general education students in grade 6 using an experimental design with repeated measures. The authors found that students using self-questioning strategies when identifying main idea outperformed the comparison condition on posttest measures of comprehension ( $ES = 0.56$ ).

Jitendra et al. (1998) studied main idea, summarization, and use of self-monitoring with four students in grade 6. Three students received treatment while one served as the control. Based upon PND performances, the researchers found that narrative

comprehension proved to be more robust (85%, 85%, 33%) when compared to expository comprehension probes (71%, 42%, 50%).

Two studies implemented prompt cards as a self-monitoring tool. Jitendra et al. (2000) compared the effects of main idea and a four-step self-monitoring approach to a comparison condition which emphasized systematic decoding and comprehension lessons. Based upon three researcher-developed main idea comprehension measures (training, near transfer, and far transfer), students in the treatment condition outperformed the comparison condition at posttest ( $M ES = 2.15$ ) and delayed posttest ( $M ES = 0.76$ ).

Four studies involved use of story mapping as a self-monitory strategy. Boyle (1996) evaluated two treatment conditions: cognitive mapping using a mnemonic device and use of notes and outlines of passages. Based upon the Formal Reading Inventory and researcher-developed curriculum-based measures, both treatment conditions resulted in positive outcomes ( $ES = 0.33$ ).

Gardill & Jitendra (1999) investigated the use of direct reading instruction paired with an advanced story map procedure on reading comprehension for six students in grades 6-8 identified with SLD using a multiple baseline across participants design. The experimental conditions consisted of baseline, intervention, generalization, and maintenance. The story map contained specific places for students to write-in common story elements (character, problem, rising actions) and implicit information (reactions, theme, and story details). The intervention took place over a 14- to 20-week time period and consisted of model, lead, and independent phases. Overall, the authors determined that all six participants increased story grammar comprehension from baseline to

independent phases of the study (PND = 100%), but basal comprehension proved to be somewhat inconsistent (PND = 100%, 67%, 33%, 33%, 100%, 100%).

Taylor, Alber, & Walker (2002) used an alternating treatments design to examine the effects of using a self-questioning strategy and/or story mapping on the reading comprehension (literal and inferential) for five elementary students in grades 3-6 identified with LD. Based on the results of the study, the authors reported both story mapping and self-questioning were effective strategies for increasing reading comprehension for students with LD. Using the Mann Whitney U to analyze the PND performances, there were no significant differences in use of story mapping and self-questioning for all five students (range: .660 to .059) but significant differences were found when compared to no intervention for both conditions (range: .002 and .005 to .000). All five students' mean comprehension scores in the story mapping (7.82 to 9.0 correct) and self-questioning (8.73 to 9.19 correct) conditions improved.

Mason (2004) and Mason et al. (2006) investigated the use of Self-Regulated Strategy Development (SRSD) instruction for TWA (Think before reading, think While reading, think After reading) and PLANS (Pick goals, List ways to meet goals, And make Notes, and Sequence notes) using a multiple probe design across subjects for nine 4<sup>th</sup> grade students (four with disabilities and five without disabilities). Although the second study examined both expository comprehension and informative writing performance, only comprehension will be reviewed for this study. At the conclusion of both studies, the authors noted improvement in reading comprehension, memory of text, and oral retelling for all students. Based upon visual analysis of PND performances, seven students attained



strong gains (100%), one student attained moderate gains (67%), and one attained no benefit (0%) based upon their ability to orally retell at least three main-ideas within one oral retell post intervention.

Two studies included the transfer of reading strategies from teacher to student through self-monitoring. Manset-Williamson & Nelson (2005) investigated two approaches involving balanced, strategic reading instruction for students in grades 4-8 struggling in reading fluency and comprehension identified with intellectual functioning above 75 SS. Specifically, the authors investigated if intensive reading instruction resulted in significant gains in reading skills and comprehension for older students. A randomized comparison group design was implemented to determine the relative effectiveness between the more explicit Phonemic Awareness/Analysis, Decoding, and Fluency + Explicit Comprehension (PDF/EC) and Phonemic Awareness and Analysis, Decoding, and Fluency + Guided Reading (PDF/GR) interventions. Explicit instruction included direct explanation, modeling, guided practice in the application of strategies as well as overt and systematic transfer of control from teacher to student regarding implementation and use of targeted strategies. The authors noted this transference of control from teacher to student involved an element of implicit self-regulation due to its cognitive nature, which should be contained within all meaningful strategy instruction procedures (Graham & Harris, 1989; Manset-Williamson & Nelson, 2005). Based upon dependent samples t-tests, the authors reported posttest scores on the dependent measures as significantly higher than pretest scores for measures targeted. Effects sizes for oral

retell (PDF/GR,  $p < .01$ ; PDF/EC,  $p < .01$ ) and main idea identification (PDF/GR,  $p = .01$ ; PDF/EC,  $p < .01$ ) were large.

Berkeley, et al. (2011) examined the influence of reading comprehension strategy (RCS) with and without attrition retraining (AR) on reading performances for students in grades 7-9 with learning and other mild disabilities using a pre-post experimental design. After attrition, the final sample consisted of 59 students identified with mild learning disabilities who qualified and received Special Education Services through the public school. AR is a motivation-enhancing treatment designed to retrain students to think about their success as something they actively influence and control. The participants were randomly assigned to one of three conditions (RCS + AR, RCS, or Reading Naturally (RN) comparison condition). Participants in both the RCS and RCS + AR were trained in how and when to use the reading comprehension strategies using the following sequence: teacher modeling, guided practice, and independent practice. The RCS + AR condition group received an additional 10 minutes of instruction regarding how to monitor their own reading comprehension using self-talk strategies and understanding effective beliefs regarding reading success and failure (self-promoting and self-defeating thoughts). For the RN condition, participants were required to complete the following tasks: make predictions about the story, use repeat reading, answer implicit and explicit factual questions from the story, and graph their fluency progress. Based upon the results of the study, the authors found that RCS instruction (with and without AR) resulted in greater strategy awareness and improved reading comprehension for participants when

compared to the control group (RN). Large effect sizes were reported for both the RCS + AR (ES = 1.44) and RCS (ES = .94) conditions.

Based upon the results of these collective studies, positive outcomes with strong effect sizes were found when reading intervention and self-monitoring strategies were implemented with a goal of increasing student comprehension and overall engagement for at-risk, LD, and ADD students. Therefore, use of evidence from these studies, which continues to accumulate, should be investigated for students with ASD.

### **Synthesis of Syntheses- Reading Interventions and Self-monitoring for Students with ASD**

To strengthen the purpose and need for this current study, a synthesis of syntheses employing treatments including reading plus self-monitoring utilizing samples of students with ASD was conducted (See Table 2.1). The following is an overview of these systematic reviews conducted over the past 18 years with a focus on engagement and reading comprehension outcomes for students with ASD based upon strategies and interventions proven to be effective with neurotypical peers (self-monitoring and reading intervention). These systematic reviews collectively represent 63 studies implementing single case design and two quasi-experimental studies. Out of the 65 studies collectively represented by these reviews, only seven met selection criteria for this current review. First, a brief description of each synthesis will be provided, then a list of relevant studies for this current review will be given.

### *Description and Purpose of Systematic Reviews*

Chiang & Lin (2007) conducted a review of literature focusing on studies that included students with ASD on various points of the spectrum, used experimental design, and focused on text and sight word comprehension (vocabulary) between 1986 and 2006. Of the 11 studies which met inclusion criteria, only three evaluated instructional methods to enhance reading comprehension for students with average intellectual ability (Kamps, Barbetta, Leonard, & Delquadri, 1994; Kamps et al., 1995; O'Connor & Klein, 2004). Based upon these studies, cueing students to draw on background knowledge and identifying anaphoric antecedents improved reading comprehension.

Whalon, et al. (2009) reviewed studies which contained one or more of the five essential components of reading instruction identified by the National Reading Panel (NRP) which included code-focused (phonological awareness, phonics, and fluency) and meaning-focused skills (vocabulary and comprehension). Through this review, the authors agreed with Chiang and Lin's findings (2007) and ascertained children with ASD can benefit from reading instruction containing these essential reading components. Specifically, students made gains on vocabulary and/or comprehension quizzes (Dugan et al., 1995; Kamps et al., 1995), question generation and responding during reading (Whalon & Hanline, 2008), and retelling the key events in a story (O'Connor & Klein, 2004). However, they did not provide a critical assessment of research quality, including effect sizes.

El Zein et al. (2013) conducted a synthesis of research with the aim of providing educators instructional strategies to improve reading comprehension for students with

ASD. Twelve studies met inclusionary criteria which contained nine different treatment conditions. The authors chose to put these conditions into four main categories: strategy instruction, anaphoric cueing, explicit instruction, and student grouping practices. Of the twelve studies, only three met the criteria for certainty of evidence evaluation and were found conclusive. Four proved to be inconclusive and five were suggestive.

After completing this synthesis, the authors determined that reading interventions typically used with students with LD could prove effective for students with ASD with modifications. Additionally, based upon a convincing body of research regarding the use of ABA as an evidence-based practice for students with ASD, the authors also suggested that ABA strategies be implemented when designing academic interventions for this specific population. Specific instructional techniques, interventions, and strategies that could prove effective but not reviewed within their synthesis included the following: main-idea summarization strategy, multi-component interventions, inference instruction, and self-monitoring procedures.

Knight et al. (2013) conducted a review to determine the evidence base for using instructional technology to teach academic skills to students with ASD. Although technology is widely used for students with ASD, the authors found a moderate level of evidence for use of technology based upon single-subject studies (Hetzroni et al., 2002; Hetzroni & Shalem, 2005; Mechling et al., 2002; Pennington et al., 2012) and no evidence based upon experimental designs. This finding was also supported by Finnegan & Mazin (2016).

El Zein et al. (2014) and Finnegan & Mazin (2016) reviewed studies which focused on instructional strategies targeting improving reading comprehension for students with ASD. Based upon their reviews, the authors concluded the use of Direct Instruction (DI) (Flores & Ganz, 2007; Flores & Ganz, 2009) and graphic organizers (Williamson et al., 2014) have the greatest benefit while cooperative learning (Whalon & Hanline, 2008), anaphoric cuing (O'Connor & Klein, 2004), and question generation (Bethune & Wood, 2013) showed promise.

Knight & Sartini (2015) conducted a review which sought to include studies that addressed comprehension across content areas. Based upon their review, the authors concluded that use of response prompting strategies and visual supports can improve comprehension across content areas of ELA. Specifically, for the purpose of this study use of graphic organizers (Bethune & Wood, 2013; Mims et al., 2012; Stringfield et al., 2011), Venn diagrams (Carnahan & Williamson, 2013), visual diagrams (Rockwell et al., 2011), and self-monitoring (Whalon & Hanline, 2008) improved overall reading comprehension past the single-word level.

Senokossoff (2016) conducted a review of research focusing on specific teaching strategies and methodologies targeting reading comprehension for students with high functioning autism between 1990 and 2012. The authors concluded cognitive strategy instruction (model of questioning, repeated readings, and story mapping) to be effective (Armstrong, 2009; Asberg & Dahlgren-Sandberg, 2010; Hundert & van Delft, 2009; Stringfield et al., 2011). Facilitating strategies (pre-reading questions, anaphoric cuing, use of cloze task, guided reciprocal questioning, and use of visual and textual cues) also

improved comprehension skills (O'Connor & Klein, 2004; Silla, 2004; Whalon & Hanline, 2008).

Finnegan & Mazin (2016) conducted a comprehensive review of the literature regarding strategies to improve reading comprehension skills for students with ASD between 1989 and 2015. Based upon their review, direct instruction and graphic organizers achieved positive effects while cooperative learning, anaphoric cueing, and question generation showed promise. Only one study not previously reported added to this conclusion. Marshal & Kasirer (2011) found significant improvements with interpretation of conventional metaphors using graphic organizers and thinking maps.

To add to previous findings, Bailey & Arciuli (2020) conducted a systematic review and quality analysis of reading instruction for students with ASD, and all studies were either single-subject or group designs. Although they included phonics and fluency skills within their review, for the purpose of this review, only studies which focused on reading comprehension will be analyzed. Based upon their review of past studies and five new studies (Bailey, Arciuli, & Stancliffe, 2017; Barnes & Rehfeldt, 2013; Kamps et al., 2016; Turner, Remington, & Hill, 2017; Zakas et al., 2013), the authors determined specific instructional strategies (question answering, question generation, and use of graphic organizers) were effective in improving reading comprehension skills for children with strengths in reading accuracy and weaknesses in reading comprehension. Multi-component instruction proved to be the most promising approach, however, based on the Evaluative Method of Determining Evidence-Based Practices in Autism (Reichow

et al., 2008), only two studies satisfied criteria for adequate or strong report strength ratings (Bailey et al., 2017; Kamps et al., 2016).

Singh, et al. (2021) conducted a review of studies focusing on the reading comprehension of students with ASD which were single case and experimental designs published between 1994 and 2017. The authors utilized comprehensive guidelines to evaluate research quality and rigor as well as sound methods to compute effect sizes and conduct visual analysis. According to the authors, previous systematic reviews for this population were lacking such in-depth analysis. In fact, only 13 studies met WWC design standards out of 17 reviewed. Based on measures of effect sizes, visually-cued instruction, metacognitive strategy instruction, and adapted text were highly effective. Collaborative strategies and technology-assisted instruction proved to be moderately effective. No effect size could be determined for behavioral strategies.

For the purpose of this current study, three studies will be reviewed in greater depth which were not included in previous syntheses (Howorth et al., 2016; Singh et al., 2017; Solis et al., 2015).

In addition to the studies located from the synthesis of syntheses, six additional studies were ascertained through the computer search of peer reviewed articles which addressed some aspect of self-monitoring and/or reading intervention on comprehension and/or engagement between the years of 2000 through 2021. Three studies were located which included self-monitoring on engagement (Beckman et al., 2019; Bryan & Gast, 2000; Carnahan Musti-Rao & Bailey, 2009), one measured self-monitoring plus reading intervention on reading comprehension (Sanders, 2020), and two evaluated self-



monitoring plus reading intervention on comprehension and engagement (Roberts et al., 2019; Drill & Bellini, 2021). Of these six studies, all were single case design.

For the current study, a total of 14 studies met the inclusion criteria, and all 14 were single case design (see Table 2.3). To review the findings of systematic syntheses plus additional studies described above in greater depth, relevant studies will be separated into three distinct but similar categories: self-monitoring intervention on engagement (Beckman, et al., 2019; Bryan & Gast, 2000; Carnahan Musti-Rao & Bailey, 2009) self-monitoring and reading intervention on reading comprehension (Bethune & Wood, 2013; Howorth, et al., 2016; Sanders, 2020; Singh, et al., 2017; Stringfield, Luscre, & Gast 2011; Whaline & Hanline, 2008), and self-monitoring and reading intervention on engagement and reading comprehension (Drill & Bellini, 2021; Roberts, et al., 2019; Solis, et al., 2015).

Of these twelve studies, eight reported treatment integrity/fidelity and ten reported social fidelity/validity. This indicates that stronger research designs need to take place in this area. All 12 studies reported positive impact regarding their individual independent and dependent variables. However, after reviewing the data, specifically the PND, intervention strategies that achieved the greatest reading comprehension and/or academic engagement proved to be use of teaching on-task and scheduled behaviors, use of interactive reading strategies paired with music, and use of strategic self-monitoring techniques.

**Self-monitoring Intervention on Engagement.** Three studies investigated the effect of self-monitoring on student engagement within a classroom setting (Beckman et al.,

2019; Bryan & Gast, 2000; Carnahan, et al., 2009). Bryan & Gast (2000) investigated the effectiveness of a two-component teaching strategy (graduated guidance and visual activity schedules) on increasing on-task and on-schedule behavior for students with ASD. An A-B-A-B withdrawal design was chosen to determine the effectiveness of using picture schedules to increase students' on-task and on-schedule behavior. The study took place in a public elementary school within the children's resource classroom. The ages of the children ranged from 7 years, 4 months to 8 years, 11 months. Researches sequenced the treatment conditions in the following manner: (a) stimulus generalization assessment pretest, (b) no book (baseline), (c) graduated guidance to teach picture-activity schedule, (d) book only (independent variable), (e) no book, and (f) return to book only. The authors noted three key points based on the results of the study: (a) students quickly learned the mechanics of the picture-activity schedule via the graduated guidance procedure, (b) students maintained high levels of independent on-task and on-schedule behaviors (picture book alone treatment), and (c) high levels of on-task behavior with appropriate scheduled materials correlated with a decrease in non-scheduled behaviors. Based upon the criteria for ascertaining PND, Bryan & Gast (2000) attained a strong effect with a PND of 100%.

Carnahan, et al. (2009) sought out to determine the effect of using interactive readers paired with music on the engagement levels of students identified with ASD and significant learning challenges during small group instruction. Six participants were chosen, ranging from 6 years, 10 months to 11 years, 5 months. Five were diagnosed with ASD and one with OHI. The study took place in a Special Education elementary

classroom within a suburban district in the Midwest. The researchers chose to use an ABCA reversal design, and the students' level of engagement was recorded during a teacher-directed group reading activity. Materials used were a combination of teacher-made and commercially prepared books. During baseline (condition A), "business as usual" was conducted as the teacher presented the class with a picture book and asked a variety of questions. Within condition B, interactive books were implemented, and condition C included interactive books paired with appropriate children's music. In conditions B and C, the books were paired with interactive pieces such as cut-out shapes, piece of clothing, small paper objects, cotton ball, or basket.

The research team collected data on each participant using a six-second rotating recording interval, with a mean of collecting data once per minute for each student. When the student was observed to demonstrate required engagement behaviors for the entire six-second interval, the observer circled "YES" on the data sheet and "NO" if they were not. The team discovered the greatest positive gains with interactive books paired with music with a mean PND of 81.5% as compared to use of interactive books alone with a mean PND of 16.33%.

Beckman et al. (2019) investigated the use of an electronic self-monitoring application (I-Connect) on academic engagement for two male students in 5<sup>th</sup> and 6<sup>th</sup> grades diagnosed with ASD using an ABAB withdrawal design. The authors also investigated a second dependent variable of academic accuracy in math and written expression. However, these outcomes will not be addressed as they are not the purpose of

the current study. The study took place in a small, Special Education self-contained classroom.

I-Connect is a web-based application which allows students to self-monitor their on-task engagement at set intervals. The participants recorded if they were on-task at 15 or 20 second intervals on the given device, and the teacher simultaneously recorded the observed behavior on a sheet of paper. On-task behavior was defined as (a) sitting in their seat, (b) making eye contact with the teacher or looking at their work, (c) utilizing a pencil to write, or (d) staying on-topic.

IOA data was collected using video recordings for 20% of sessions across all phases of the study. Overall, the mean total IOA proved to be 96.5% (range: 92% to 100%). The intervention proved to be strong as the first participant increased engagement from an average of 45.7% during baseline/withdrawal to 95.9% during intervention phases, and the second participant increased engagement from an average of 13.6% during baseline/withdrawal to 90.9% during intervention phases. Both participants achieved 100% PND.

**Self-monitoring and Reading Intervention on Reading Comprehension.** Two studies employed some type of graphic organizer as a self-monitoring strategy (Bethune & Wood, 2013; Stringfield et al., 2011). Stringfield et al. (2011) chose to investigate the effects of using a story map graphic organizer to enhance reading comprehension for three boys in grades 3-5 diagnosed with HFA using a multiple baseline across participants design. The intervention took place in a self-contained classroom during language arts instruction. The graphic organizer was a story map which the students were

required to fill out during instruction which contained the following components: setting (characters, time, place) and story development (beginning, middle, and end). Upon completion of the lesson, the students used their maps to take a modified (oral) Accelerated Reader (AR) quiz, and their responses were graphed as “prompted” or “unprompted.” Three phases of the study were reported: baseline, story outline, choice, and maintenance. Choice and maintenance conditions allowed the students to choose if they wanted to use the story map without assistance during instruction. If they chose to fill out the map, they could use it while taking the AR test.

Positive effects were found for both accuracy of story map completion and correct quiz responses based upon Accelerated Reader story quizzes (PND = 100%, 75%, 75%). The authors determined two students did not use the map, and the one that did, also used it within the maintenance phase. Regardless, all three students increased their story comprehension, which strengthened the value of the intervention.

Bethune & Wood (2013) investigated the effects of using a graphic organizer on the accuracy of answering wh-questions for three boys diagnosed with ASD in grades 3-5 using a delayed multiple baseline across participants design. The study took place in Special Education self-contained classrooms designed for students on the spectrum. The graphic organizer was a piece of paper with four sections labeled Who (person), Where (place), What (thing), and What doing (event). First, the participants were asked to sort/write words from the story into the four categories based upon which wh-question it would answer (e.g., “mom” is a who). After correctly sorting the various words, students

were asked two literal questions from each category relating to the story. IOA data was taken for each participant and averaged 97.5%, 97.5%, and 100%.

Overall, the results of this study proved positive. A functional relationship was found between intervention (graphic organizer) and the reading outcome (literal comprehension) based upon PND scores of 100%, 100%, and 71%. Additionally, the authors found all three students evidenced a high level of maintenance (three-five weeks) and generalization of skill to their regular reading instruction.

Three studies implemented the use of a self-questioning technique to improve reading comprehension (Howorth, et al., 2016; Sanders, 2020; Whalon & Hanline, 2020). Whalon & Hanline (2020) investigated the use of a reciprocal questioning comprehension strategy (using self-monitoring checklist, story cards (containing elements of the story, corresponding picture, generic question), and question cards (e.g., who, what, when, where, why, and how) on the ability of three students diagnosed with ASD in grades 2-3 to generate and answer questions regarding the content of a story using a multiple baseline design across participants. The study took place in in a room outside the general and Special Education classrooms.

IOA data was ascertained via video taping for 30% of all collected student data. Agreement was considered “good” for student generated questions (85%) and prompted and unprompted question generation (90%).

The authors found a functional relationship between the implementation of the intervention (reciprocal questioning technique and self-monitoring) on question generation (PND = 92%, 65%, 79%) and comprehension accuracy (PND = 100%, 100%,

41%). Additionally, social validity data documented that both students and parents believed the intervention was beneficial.

Howorth, et al. (2016) investigated the impact of the metacognitive strategy of “Think before reading, think While reading, and think After reading” (TWA) on expository text comprehension for four boys with ASD in grades 5-6 using a multiple-baseline design. The study took place within three different districts in three inclusive classrooms and one self-contained. IOA data was collected using audio tape recordings for 40% of the baseline and 33% of the intervention sessions. Based upon these recordings, IOA was found to be 90% (baseline) and 100% (intervention).

The study took place in three phases: baseline, instruction, and maintenance. During the instructional phase, participants were taught to generate questions prior to reading (*What is the author’s purpose?, What do they already know?, What do they want to know?*), monitor their progress as they read (speed, link prior knowledge, reread when confused), and document key parts of the story (main idea, details, what they learned). To facilitate this process the students were taught to use a self-made checklist to ensure they completed each part of the nine-step strategy.

Two reading outcome measures were used to evaluate the effect of the treatment: retell and comprehension questions. For the retell condition, students were instructed to use the TWA strategy (including checklist) and then orally summarize the story, which was recorded. Responses were evaluated using a rubric designed by the researchers. The comprehension questions evaluated the student’s understanding of text structure, explicit information within the text, inferential reasoning, main idea, vocabulary, and syntax.

Overall, the effect of the intervention proved to be strong. The authors chose to report percentage of non-overlapping data (PND) and percentage exceeding the median (PEM) data for both oral retell and comprehension questions. For oral retell, the following scores were reported for PND and PEM consecutively for each student: 100%, 100%; 66.7%, 83.3%; 50.0%, 100%; 83.3%, 100%. For comprehension questions, the following scores were reported for PND and PEM consecutively for each student: 100%, 100%; NC, 83.3%; 83.3%, 100%; 83.3%, 100%. The authors did not calculate one score due to a single data point at the ceiling (100%) during the baseline phase. The authors reported that these gains were maintained for both questions and retell over time.

Sanders (2020) investigated the effects of using the self-monitoring mnemonic strategy of “Think before reading, Read the paragraph, Ask yourself what the paragraph is mostly about and what is the most important question, and Paraphrase the paragraph” (TRAP) on the reading comprehension for four boys diagnosed with ED, OHI, ASD/GIFTED, and ASD in grades 5-6 using a multiple baseline across participants design. The study took place in Special Education self-contained classrooms designed for students on the spectrum. This study was very similar to Howorth et al. (2016) in design; however, this study focused on oral retells only. This study also achieved a large effect size as all four students achieved PND of 100%.

One study focused on the use of a behavioral approach to teach reading skills. Singh et al. (2017) investigated the effects of behavior skills training (BST) and reciprocal teaching (RT) on the reading comprehension skills of a 7<sup>th</sup> grade boy diagnosed with HFA using a multiple probe across skills design. Specific RT skills



targeted were predicting, questioning, clarifying, and summarizing. BST consisted of four steps: (a) explicit instruction about the nature and purpose of the skill, (b) demonstration of the skill, (c) rehearsal of skill within 10 seconds of a verbal prompt, and (d) feedback in the form of praise or error correction. The study took place in the dining room of the participant's home. IOA data was collected between the researcher and observer, and proved to be between 90% to 100% for all conditions.

For the BST Questioning and Summarizing skills, the researcher taught the participant to use a graphic organizer for question stems (who, what, when, where, why) and for story elements (what happened, who was there, where did it happen, when did it happen, why/how did it happen).

Based upon PND, a strong relationship was found between intervention and reading outcomes for each skill. The total PND score was 100% while the PND score for the student's reading comprehension execution was 92%. Both the parents and the student found the intervention to be easy to use and helpful.

**Self-monitoring and Reading Intervention on Comprehension and Engagement.** Three studies were located which investigated both self-monitoring and some type of reading intervention on comprehension and engagement (Drill & Bellini, 2021; Roberts et al., 2019; Solis et al., 2015). As this is the focus of this current study, these studies will be reviewed in greater depth.

Solis et al. (2015) conducted a study regarding reading comprehension interventions targeted for students with ASD. The authors designed two separate but related single-case studies using alternating treatment designs. Study 1 compared

question development supported by Applied Behavioral Analysis (ABA) techniques with a question development only treatment. Study 2 focused on comparing an anaphoric cueing plus ABA treatment with an anaphoric cueing only treatment. Anaphoric cueing is a facilitation method that aids reading comprehension through identifying referents within the text (e.g., pronouns). In both studies, the authors compared the relative effects of the experimental designs to ascertain whether performance on reading outcomes and measures of on-task behavior improved with the addition of ABA strategies.

Two participants were chosen for each study, and all were males ages 10-13. All four participants had been diagnosed with ASD, a speech impairment, and evidenced average intelligence based upon standardized testing. One student had a comorbid condition of ADHD. The study took place in a rural school district outside a major metropolitan area in the Southwestern part of the United States. The intervention was delivered in a one-on-one setting within a Special Education or literacy classroom. The instructor was a graduate student with extensive background in ABA, a master's degree in education and three years of experience working with students with ASD. Fidelity of implementation was met by creating an implementation validity checklist (IVC) which contained the following components: (a) instructional procedures, (b) use of visual supports, (c) checklist, and (d) token economy. Using a 4-point Likert-type scale, all four components of the two treatments were coded and analyzed. Interrater reliability of 100% was reached, which meets the gold standard method (Gwet, 2001).

For the question development treatment, students were asked to create questions based upon text content that were explicitly stated within the text or "right there" when

given question stems (e.g., who, what where, when). When ABA techniques were utilized, researchers included use of a graphic organizer, token economy, and readings which included the individual student's perseverative interest. Upon completion of each intervention session, each participant was administered a researcher-developed CBM reading probe to assess overall comprehension, which aligned with the text presented in the treatment condition. On-task behavior was measured through review of videos of each lesson and student behavior was marked "on-task" or "off-task." On-task behaviors were noted if the student was observed to be: (a) sitting in seat, (b) looking at the assignment or the instructor, (c) using instructional materials in the intended manner, and/or (d) engaging appropriately in the task. Off-task behavior was coded when the student was observed to: (a) not participating in the task, (b) leaving seat without permission, (c) turning away from materials or instructor, (d) putting head down on table, (e) making comments or asking questions that were irrelevant or off-topic, (f) using materials inappropriately, and/or (g) looking away from materials or instructor for longer than two seconds.

Study 2 also used an alternating treatments design to determine the effect of using an anaphoric cueing plus ABA treatment compared to no ABA treatment. The authors noted within the study that the instructor, setting, participant selection criteria, professional development, text selection, scoring and data collection, IOA, and data analysis were the same as Study 1. The primary purpose of this study was to teach students how to use an anaphoric cueing system which focused on identification of pronouns to aid overall comprehension. Explicit instruction was implemented which

included modeling, guided practice, and independent practice. Anaphoric cueing plus ABA instilled the same strategies as Study 1 (visual supports, token economy, and readings based on individual perseverative interests).

Solis et al. (2015) achieved 100% PND with implementation of question development in conjunction with ABA. Percentage of on-task behavior also achieved 100% PND when ABA techniques were included within the intervention. Additionally, anaphoric cueing paired with ABA achieved 100% PND for both CBM probes and on-task behavior for both participants.

After completion of the experimental study, the authors noted that their findings indicated that the addition of ABA strategies to both question development and anaphoric cueing improved both the overall reading comprehension and on-task behavior for students identified with ASD.

Roberts et al. (2019) conducted a study using an ABAB withdrawal design to examine the effects of using a self-management intervention paired with a peer trainer (SM + PT) on the academic engagement of two high school boys diagnosed with ASD. It is interesting to note that the peer trainer selected was also a high school student diagnosed with ASD. Based upon WWC Procedures and Standards Handbook guidelines (2017), the authors found moderate evidence for a causal relationship of the SM + PT intervention and academic engagement for both boys. The ABAB single-case design consisted of two baseline and two self-management intervention phases. The authors chose to implement three within-phase (level, trend, and range of data) and three

between-adjacent-variables (immediacy of effect, degree of overlap, and consistency of data in similar phases).

The study took place in a public rural high school. Sessions took place within a Special Education study skills class, which was first period for a duration of 50 minutes. The class contained five students, one paraprofessional, and one Special Education teacher. The peer trainer was trained over a 50-minute time period and focused on the following skills: components of the self-management intervention, appropriate and inappropriate behaviors, classroom behavioral expectations, how to complete the “to-do list” form, and how students were to complete the self-management form. The two participants received similar training on a subsequent day.

Based upon Koegel & Koegel’s (1995) self-management techniques, the following target behaviors were addressed: (a) operationally defining all target behaviors, (b) identifying reinforcers to be earned for meeting a specified goal, (c) designing a self-management system, (d) teaching the participants to use the self-management system, allowing them to self-monitor, self-record, and self-evaluate, and (e) teaching the participants to be independent in the use of the self-management system. Target behaviors of the study were operationally defined into two phrases. First, students were instructed as to what assignments were to be completed during their study skills class (completing “to-do” list). Next, they were asked to review their daily goals and/or appropriate behaviors with the classroom staff.

At the conclusion of their study, the authors determined that engagement increased on an average of 56% from Baseline 1 to the end of Treatment 2, and social

validity indicated that the treatment was feasible, acceptable, useful, and effective based upon a six-point Likert-type social validity questionnaire. Based upon the Special Education teacher's ratings, training, support, and coaching earned a 4.75 score; feasibility and acceptability was 5.57; and usefulness and effectiveness was a 5.57. Based upon visual inspection of PND, both boys achieved 100% improvement when baseline data points were compared with the second intervention phase.

Drill & Bellini (2021) investigated the effects of combining three separate research-based interventions (Reader's Theater, story mapping, video self-modeling) into one succinct intervention on the narrative reading comprehension of three male students in grades 5-8 diagnosed with ASD using a multiple-baseline across participants design. The study took place in a one-on-one, quiet setting in the participants' homes. The study took place over three phases: baseline, intervention, and maintenance. IOA data was collected across all participants and phases of the study for 30% of Comprehension Quiz Protocols (CQP). An IOA rate of 96% was achieved across participants and phases for correct responses and 95% for CQP incorrect responses.

Two books, *Harry Potter and the Sorcerer's Stone* by Rowling (1997) and *Artemis Fowl* by Colfer (2001) were used for the intervention. For each intervention session, the participants used a visual schedule to check off each component covered within the session. Each intervention session lasted approximately one hour and consisted of 10 steps: (a) review of visual schedule, (b) watch a video of themselves acting out the Reader's Theatre script from the previous chapter of the book, (c) review the previous Character Story Event Map (CSEM) prior to reading the next section of the novel, (d)

make a prediction and then read the next section of the novel, (e) after reading the next chapter, engage in a 1-2 minutes Reader's Theatre activity, (f) practice the Reader's Theater script, (g) video themselves acting out the script, (h) review the purpose of completing a CSEM with researcher (including modeling correct answers), (i) researcher identified missing information (which characters were involved and why the event was important), and (j) complete a ten-question CQP based upon the current chapter.

Through visual inspection and descriptive analysis of the mean CQP scores across phases, and use of Improved Rate of Difference (IRD), the authors assessed the magnitude of change, rapidity of change, trend analysis, and variability. Overall, the intervention attained moderate effects with IRD scores of 0.662, 0.651, and 0.671.

### **Rationale for Current Study**

Overall, after completion of this review it is evident that research is still needed regarding use of self-monitoring paired with reading intervention strategies for students with ASD. Limited studies have been conducted, and according to Roberts et al. (2019) and Briesch et al. (2018) self-monitoring intervention research is still needed. Specifically, for this population outcomes vary by treatment components, settings, sample sizes, participants, and there is no "one-size-fits-all" for self-monitoring and reading interventions on comprehension and/or academic engagement time. Based upon the data ascertained from these studies, use of strategic self-monitoring strategies and reading intervention strategies targeted for students with ASD improved overall academic engagement time and reading comprehension, which has proven to be a key component in effective programming for students with ASD (Sparapani, et al., 2015). Paucity of

research in this area for students with ASD is concerning; however, based upon the results of these studies, use of strategic strategies is promising.

Therefore, more research needs to be conducted in this area as the prevalence of ASD is increasing each year. Additionally, students with ASD are increasingly being placed in least restricted environments, including typically developing classrooms; thus, educators need to be informed regarding evidenced based practices that support the needs of this population. Specifically, the author seeks to determine if using a self-monitoring strategy plus reading intervention will increase overall academic engagement, which in turn should improve overall comprehension of students with ASD. After reviewing the literature, little exploration has been conducted in this specific area as only three studies were located with these specific independent and dependent variables.

Based upon the results of these collective studies, positive outcomes with strong effect sizes were found when reading intervention and/or self-monitoring strategies were implemented with a goal of increasing student comprehension and/or overall engagement for students with ASD.

### **Summary**

Based upon these systematic reviews and additional studies, students with ASD can benefit from multiple-component reading instruction based upon their unique needs. Collectively, these studies found a positive relationship between cueing students to draw upon background knowledge, identifying anaphoric antecedents, interactive reading instruction, cognitive and mnemonic strategies, summarization/main idea direct



instruction paired with self-monitoring strategies on increased engagement and comprehension.

Limitations for the overall findings reviewed include lack of fidelity, small sample sizes, poor in-depth statistical analysis, and reduced number of overall research studies. Nonetheless, the findings of these studies are encouraging for classroom teachers, whether providing education for students with exceptionalities in Special Education or typically developing classrooms. Intervention strategies can be implemented that are strategic, observable, and systematic which gain positive results for overall academic engagement and comprehension. Future studies need to ascertain if increasing academic engagement creates a positive correlation with overall academic achievement, as this is an area that has not been formally measured using qualitative measures.

Table 2.1 *Systematic Reviews*

Study	N	Focus of Review	Time Period	Age/ Grade	Primary Disability
Accardo (2015)	13	Reading Comprehension	1994-2014	K-12 <sup>th</sup>	ASD
Bailey & Arciuli (2020)	19	Reading Comprehension “Big Five” Elements of Reading Instruction	2009- 2017	5-12 yrs	ASD
Brown, Oram-Cardy, & Johnson (2013)	36	Reading Comprehension	2008-2011	Not specified	ASD
Chiang & Lin (2007)	11	Reading Comprehension	1994-2005	4-17 yrs	ASD
El Zein, Solis, Vaughn, & McCulley (2013)	12	Reading Intervention	1980-2012	K-12 <sup>th</sup>	ASD
Finnegan & Mazin (2016)	15	Reading Comprehension	1989-2015	7-17 yrs	ASD
Knight, McKissick, & Saunders (2013)	25	Technology Based Interventions Impact on Academic Skills	1993-2012	4-18 yrs	ASD
Knight & Sartini (2015)	23	Comprehension Across Academic Areas	2007-2013	7-14 yrs	ASD
Scammacca et al. (2007)	31	Effectiveness of Reading Intervention Strategies	1983-2004	4 <sup>th</sup> -11 <sup>th</sup>	LD At-risk

Study	N	Focus of Review	Time Period	Age/ Grade	Primary Disability
Scammacca, Roberts, Vaughn, & Stuebing (2015)	36	Effectiveness of Reading Intervention Strategies as Compared to Previous Studies	1980-2011	4 <sup>th</sup> -12 <sup>th</sup>	Struggling Readers
Senokossoff (2016)	19	Reading Comprehension Teaching Strategies and Testing	1990-2012	7 yrs- young adult	HFASD
Singh, Moore, Furlonger, Anderson, Fall & Howorth (2021)	16	Reading Comprehension Intervention for Students with ASD Which Met Standards for Evidence-based SCD Research	<2017	K-12	ASD
Solis, Ciullo, Vaughn, Pyle, Hassaram, & Leroux (2012)	12	Reading Comprehension Interventions for At-risk, ADD, and LD Students	1979-2009	6 <sup>th</sup> -8 <sup>th</sup>	LD Middle School
Wanzek, Wexler, Vaughn, & Ciullo (2009)	24	Reading Interventions	1988-2007	4 <sup>th</sup> -5 <sup>th</sup>	LD, RD
Whalon, Otaiba, & Delano (2009)	11	Reading Instruction targeting 1 or more of the 5 Components of Reading	1976-2005	4-17 yrs	ASD

*Note:* ASD = autism spectrum disorder; HFASD = high functioning autism spectrum disorder; LD = learning disability; RD = reading disability; yrs = years

Table 2.2 *Self-monitoring and Reading Interventions on Engagement and Comprehension Outcomes for At-risk, LD, and ADD*

Study	N	Grade	Student LD Status	Intervention Type	Duration	Engagement/ Reading Outcomes	Results Summary
Berkely, Mastropieri, & Scruggs (2011)  Design: Pre-post Experimental 6-week Delayed Post-test	59	7 <sup>th</sup> -9 <sup>th</sup>	LD	SM: Prompt cards RI: RCS with/without Attribution Retraining	4 weeks 12 sessions (30 min)	EO: NI RO: Summary	Summary test ES = 1.44 Delayed posttest, ES = 1.21 Passage test ES = 0.14 Delayed posttest, ES = 0.26MSI ES = 1.10 Delayed posttest, ES = 0.87
Boyle (1996)  Design: Quasi-exp Treatment Comparison	30	6 <sup>th</sup> -8 <sup>th</sup>	20-LD 10 EMR	SM: Cognitive Mapping TRAVEL RI: NI	11 sessions 3-5/week (50 min)	EO: NI RO: Comp	FRI T vs. C, ES = .33 Below grade level Literal T vs. C, ES = 0.86 Inferential T vs. C, ES = 0.76 Grade level Literal T vs. C, ES = 0.87 Inferential T vs. C, ES = 0.95

Bruhn & Watt (2012)	2	7 <sup>th</sup> -8 <sup>th</sup>	ADHD At-risk	SM: Check-list RI: Read 180	17 sessions (60 min)	EO: On-task RO: NI	Mae = 100% Olivia = 80%
Design: ABAB Withdrawal							
Edwards, Salant, Howard, Brouger, & McLaughlin (1995)	3	3 <sup>rd</sup> -4 <sup>th</sup>	ADHD	SM: Self- management Token System RI: NI	52 sessions (20 min)	EO: Attention to Task RO: Comp	Subject 1: On-task BL1 M = 13.5% SM1 M = 61% BL2 M = 36.5% SM2 + Fading M = 52.3% Follow up = 55%, 70% Reading Comprehension BL1 M = 10% SM1 M = 52% BL2 M = 21% SM + Fading M = 38% Follow-up = 30%, 50% Subject 2: On-task BL1 M = 33% SM1 M = 70% BL2 M = 38%
Design: Single Subject ABABC							

SM2 + Fading M =  
53%

Follow up = 75%,  
60%

Reading

Comprehension

BL1 M = 19%

SM1 M = 57.3%

BL2 M = 40%

SM + Fading M =  
58.6%

Follow-up = 60%,  
50%

Subject 3

On-task

BL1 M = 43.5%

SM1 M = 93%

BL2 M = 59.5%

SM2 + Fading M =  
82.3%

Follow-up = 80%,  
85%

Reading

Comprehension

BL1 M = 33%

SM1 M = 79.3%

BL2 M = 49%

SM + Fading M =  
72%

							Follow-up = 80%, 70%
Gardill & Jitendra (1999)	6	6 <sup>th</sup> -8 <sup>th</sup>	5-LD 1-ND	SM: Story Maps for Key Elements RI: NI	30 sessions (50 min)	EO: NI RO: Comp	Literal and Inferential Marvin = 67% Mark = 50% Chad = 20% Mitch = 10% Tara = 80% Jack = 100% Story Grammar 100% for all students Pretest = 35.8% Posttest = 56.5%
Design: Single Participant							
Graves & Levin (1989)	30	5 <sup>th</sup> -8 <sup>th</sup>	LD	SM: Self- questioning RI: Main Idea	1 session (68 min)	EO: NI RO: Comp	Main Idea Identification T1 vs. C, ES =2.55 T2 vs. C, ES = 1.41 T1 vs. T2, ES = 1.13
Design: Random Assignment Treatment Comparison							
Harris, Friedlander, Frizzelle, & Graham (2005)	6	3 <sup>rd</sup> -5 <sup>th</sup>	ADHD	SM: Attention/ Performance RI: NI	32 sessions (15 min)	EO: On-task RO: NI	William SMA= 100% SMP = 80% Vanyel SMA = 100%

Design: Counter-balanced, multiple-baseline, across subjects								<p>SMP = 100%</p> <p>Thomas</p> <p>SMA = 100%</p> <p>SMP = 0%</p> <p>(achieved high scores at BL)</p> <p>Ryis</p> <p>SMA = 67%</p> <p>SMP = 100%</p> <p>Samuel</p> <p>SMA = 80%</p> <p>SMP = 100%</p> <p>Raven</p> <p>SMA = 100%</p> <p>SMP = 75%</p>
Jitendra, Cole, Hoppes, & Wilson (1998)	4	6 <sup>th</sup>	LD	SM: Prompt Cards RI: Main Idea/Summarization	20-40 sessions (40-50 min)	EO: NI RO: Nar/Exp Comp	<p>Narrative</p> <p>Chris = 85%</p> <p>Tanya = 85%</p> <p>Brian = 33%</p> <p>Expository</p> <p>Chris = 71%</p> <p>Tanya = 42%</p> <p>Brian = 50%</p> <p>No PND available for fourth student (control)</p>	
Design: Single Participant multiple probe								
Jitendra, Hoppes, & Xin (2000)	33	6 <sup>th</sup> -8 <sup>th</sup>	29-LD 4-SED	SM: Checklist Cards	15 sessions	EO: NI RO: Nar/Exp	<p>Training posttest</p> <p>T vs. C, ES = 2.19</p>	



					RI: Scripted Lesson	(30-40 min)	Comp	Training delayed T vs. C, ES = 1.02 Near transfer T vs. C, ES = 2.47 Near transfer delayed T vs. C, ES = 0.66 Far transfer T vs. C, ES = 1.81 Far transfer delayed T vs. C, ES = 0.61
09	Malone & Mastropieri (1992)	45	6 <sup>th</sup> -8 <sup>th</sup>	LD	SM: Check-list RI: Summary Training	2 sessions (1/day)	EO: NI RO: Sum Near/Far Transfer	Test of training T1 vs. C, ES = 2.87 T2 vs. C, ES = 2.12 T1 vs. T2, ES = 0.35 Near transfer T1 vs. C, ES = 1.31 T2 vs. C, ES = 1.43 T1 vs. T2, ES = 0.02 Far transfer T1 vs. C, ES = 1.13 T2 vs. C, ES = 2.07 T1 vs. T2, ES = -0.74
	Manset-Williamson & Nelson (2005)	20	4 <sup>th</sup> -8 <sup>th</sup>	19-RD 1-ADHD	SM: PDF/GR RI: PDF/EC	6 wks 4 days/wk 60 mi	EO: NI RO: Fluency/Comp	More explicit comprehension strategy

Design: Randomized Comparison Group							outperformed less explicit (p > .05)
Mason, Snyder, Sukhram, & Kedem (2006)	9	4 <sup>th</sup>	4-LD 5-TD	SM: PLANS RI: SRSD TWA	26 wks	EO: NI RO: Expos Comp	Main Idea in Oral Retells Noah = 100% Robert = 100% John = 67% Kelly = 67% Amber = 100% Ned = 100% Meredith = 100% Michael = 0% Charisse = 100%
Design: Multiple Probe Across Subjects							
Rock (2005)	9	2 <sup>nd</sup> -5 <sup>th</sup>	1-Gifted 1-AS 1-LD/ADD 1-LD 1-LD/SLI 2-TD 1-ADHD 1-FHS/SLI	SM: Attention/ Performance ACT-REACT RI: NI	22 Days (60 min)	EO: On-task/ productivity RO: NI	Engaged Behavior John Int 1 = 100%, Int 2 = 100% Mason Int 1 = 100%, Int 2 = 100% Lucas = Int 1 = 100%, Int 2 = 100% Won = Int 1 = 100%, Int 2 = 100% Buck = Int 1 = 100%,
Design: Multiple- baseline-across subjects with an embedded reversal							

							Int 2 = 100% Bill = Int 1 = 100%, Int 2 = 100% Danny = Int 1 = 100%, Int 2 = 100% Chris = Int 1 = 100%, Int 2 = 100% Anna = Int 1 = 70%, Int 2 = 100%
Shimabukuro, Prater, Jenkins, & Edelen-Smith (1999)	3	6 <sup>th</sup> -7 <sup>th</sup>	LD/ADHD	SM: Graph productivity RI: NI	30-32 Days (45 min)	EO: On-task/ Productivity RO: Comp Accuracy	Glen Productivity = 100% Accuracy = 100% Manny Productivity = 100% Accuracy = 96% Nelson Productivity = 100% Accuracy = 92%
Design: Single Group Multiple- baseline							
Taylor, Alber, & Walker (2002)	5	4 <sup>th</sup> -5 <sup>th</sup>	LD/SLI	SM: Story Mapping RI: Self- questioning	35 sessions 3/wk	EO: NI RO: Literal/ Inferential Comp	Joseph SQ and SM, p = .660 SQ and Ni, p = .000 SM and Ni, p = .005 Michael SQ and SM, p = .059 SQ and Ni, p = .000 SM and Ni, p = .000 Justin SQ and SM, p = .621
Design: Alternating Treatments							

							SQ and Ni, p = .001 SM and Ni, p = .001 Leroy SQ and SM, p = .268 SQ and Ni, p = .000 SM and Ni, p = .001 Michelle SQ and SM, p = .299 SQ and Ni, p = .002 SM and Ni, p = .001
Wong & Jones (1992)	120	6 <sup>th</sup> 8 <sup>th</sup> _9 <sup>th</sup>	TD 60-LD	SM: Self- Questioning RI: Main Idea	5 sessions (three-1hr, two-2 hr)	EO: NI RO: Comp of Key Ideas	Comprehension test T vs. C, ES = 0.56
Design: Random Assignment Treatment Comparison							

*Note:* ACT/REACT = Articulate your goals, Create a work plan, Take pictures, Reflect using self-talk, and ACT again; ADHD = Attention Deficit Disorder; BL = baseline; C = control group; Comp = comprehension; EMR = Educationally Mentally Retarded; EO = engagement outcome; ES = effect size; Expos = expository; FRI = Formal Reading Inventory; hr = hour(s); exp = expository; LD= Learning Disabled; nar = narrative; MSI = Meta-Comprehension Strategy Index; ND = Neurological Disorder; Ni= no intervention; NI = not included in design study; PDF/EC = Phonemic Awareness/Analysis, Decoding, and Fluency + Explicit Instruction; PDF/GR = Phonemic Awareness/Analysis, Decoding, and Fluency Instruction + Guided Reading; PLANS = pick goals, List ways to meet goals, And, make Notes and Sequence notes; p = probability level; SQ = self-questioning; RCS = reading comprehension strategy; RD =Reading Difficulty; RI = reading intervention; RO = reading outcome; SED = Severely Emotionally Disturbed; SLI = Speech Language Impairment; SM = self-monitoring; SMA = self-monitoring of attention; SMP = self-monitoring of performance; SRSD = Self-Regulated Strategy Development; Sum = summary; T = treatment condition; TD = typically developing;

TRAVEL = Topic, Read, Ask, Verify, Examine, Link; TWA = Think before reading, think While reading, think After reading; vs. = versus; wk = week(s); Quasi-exp = quasi-experimental.

Table 2.3 *Self-monitoring and Reading Interventions on Engagement and Comprehension Outcomes for Students with ASD*

Study	N	Grade/ Age	Student LD Status	Intervention Type	Duration	Engagement/ Reading Outcomes	Results Summary
Beckman, Mason, Wills, Garrison-Kane, & Huffman (2019)	2	10-11 yrs	ASD	SM (I-Connect) RI: NI	21 sessions	EO: On-task Behavior RO: NI	On-task behavior PND = 100%, 100%
Design: ABAB withdrawal							
65 Bethune & Wood (2013)	3	8-10 yrs	ASD	SM: Graphic organizer RI: NI	30 sessions (10 min)	EO: NI RO: Accuracy of Wh-questions	Questions PND = 100%, 100%, 71%
Design: Delayed multiple-baseline across participants							
Bryan & Gast (2000)	4	6-11yrs	HFA	SM: Graduated guidance and visual schedules RI: NI	32 sessions 5 dys/wk (40 min)	EO: On-task and On- schedule Behavior RO: NI	On-task PND = 100%, 100%, 100%, 100% On-schedule PND = 100%, 100%, 100%, 100%
Design: SCD with ABAB withdrawal							

Study	N	Grade/ Age	Student LD Status	Intervention Type	Duration	Engagement/ Reading Outcomes	Results Summary
Carnahan, Musti-Rao, & Bailey (2009) Design: SCD with ABCAC reversal	6	6-11yrs	ASD 1-OHI	SM: NI RI: Interactive Reading Material		EO: Academic Engagement Time RO: NI	Interactive books only Inconclusive data Music + interactive books M = 51%-91% Robust IRD = 0.662, 0.651, 0.671
Drill & Bellini (2021)  Design: Multiple- baseline Across Participants	3	5 <sup>th</sup> -8 <sup>th</sup>	ASD	SM: Mapping, Video Self- Monitoring RI: Readers Theatre, Story	27-29 Sessions	EO: NI RO: Reading Comp	
Howorth, Lopata, Thomeer, & Rodgers (2016)  Design: Multiple-baseline	4	5 <sup>th</sup> -6 <sup>th</sup>	ASD	SM: Self- monitoring RI: TWA	33 Sessions	EO: NI RO: Expository Text Comp	Oral-retell PND = 100%, 66.7%, 50.0%, 83.3% Comp. Questions PND = 100%, NC%, 83.3, 83.3% *NC = Not calculated due to a single data point at the ceiling 100% during baseline phase.

Study	N	Grade/ Age	Student LD Status	Intervention Type	Duration	Engagement/ Reading Outcomes	Results Summary
Roberts, Mize, Reutebuch, Falcomata, Capin, & Steelman (2019)	2	17-18 yrs	ASD	SM: Strategic Self-monitoring (ACT-REACT) RI: NI	18 sessions (30 min)	EO: Academic Engagement Time RO: NI	Engagement across B1, T1, B2, T2 Andrew M= 22%, 51%, 44%, 73% Derek M = 28%, 79%, 51%, 88%
Design: SCD with ABAB withdrawal							
Sanders (2020)	4	5 <sup>th</sup> -6 <sup>th</sup>	1-ED 1-OHI 1-ASD/ Gifted 1-ASD	SM: NI RI: TRAP	17 Sessions	EO: NI RO: Comp	Oral-retell comprehension PND = 100%, 100%, 100%, 100%,
Design: Multiple-baseline across students							
Singh, Moore, Furlonger, Anderson, Busacca, & English (2017)	1	7 <sup>th</sup>	ASD	SM: NI RI: Behavior Skills Training	17 Sessions	EO: NI RO: Comp Predicting, Questioning, Clarifying, Summarizing	Reading Comprehension PND = 100% Predicting PND = 100% Questioning PND = 100% Clarifying PND = 100% Summarizing PND = 100%
Design: Multiple Probe Across Skills							



Study	N	Grade/ Age	Student LD Status	Intervention Type	Duration	Engagement/ Reading Outcomes	Results Summary
Solis, El Zein, Vaughn, McCulley, & Falcomata (2015)  Design: SCD with alternating treatments	4	10-13 yrs	ASD/ ADD/SI 2-ASD/SI AS/SI	SM: Use of continuous positive reinforcement schedule Self- monitoring checklist (ABA) RI: Use of anaphoric cueing system paired with ABA	2 wks 4-5/wks (30 min)	EO: On-task behaviors during reading tasks RO: Comp	Question Dev. + ABA PND = 100%, 100% AC + ABA PND CBM = 100%, 100% PND On-task = 100%, 100%
Stringfield, Luscre, & Gast (2011)  Design: Multiple baseline	3	8.1-11.2 yrs	ASD	SM: Story map graphic organizer (characters, place, time, beginning, middle, end) RI: NI	42 Sessions (15 min)	EO: NI RO: Story Recall	PND = 100%, 88%, 85% M increase 77.3% baseline (16%) to Int. (93.3%)
Whalon & Hanline (2008)	3	7-8 yrs	ASD	RI: Reciprocal Question Strategy	18-22 Sessions (20 min)	EO: NI RO: Question Generation Responding	Question generation PND = 92%, 65%, 79% Responding

Study	N	Grade/ Age	Student LD Status	Intervention Type	Duration	Engagement/ Reading Outcomes	Results Summary
							PND = 100%, 100%, 41%

*Note:* ABA = applied behavior analysis; AC = anaphoric cuing; ADD/ADHD = Attention Deficit Disorder; ASD = Autism Spectrum Disorder; CBM = curriculum based measures; comp = comprehension; Dev = development; dys = days; HFA = High Functioning Autism; EO = engagement outcome(s); GE = general education; hr = hour; IRD = improvement rate difference; LD = learning disability; min =minutes; MT = multiple treatments; NI = not included in this study; OHI = other health impaired; PND = percentage of non-overlapping data; RI = reading intervention; RO = reading outcome(s); quasi-exp. = quasi-experimental SED = serious emotionally disturbance; SM = self-monitoring strategy; SI = sensory integration dysfunction; TC = Treatment vs. Comparison; TD = typically developing; TRAP = Think Before Reading, Read the Paragraph, Ask yourself what the paragraph is mostly about, Paraphrase the paragraph; TWA = Think Before Reading, Think While Reading, Thinking After Reading; wks = weeks; yrs = years.

## CHAPTER III

### METHOD

#### **Overview**

In this chapter, the following components of the study will be discussed and explained: research questions, research design, participants and selection criteria, training of intervention specialists, setting and materials, explicit systematic instruction and procedures, interventions, and measures.

Many students with ASD struggle to attain reading comprehension skills commensurate with their decoding and sight recognition skills (Jones et al., 2009; Solis, et al., 2015; Wagner, Brown et al., 2013). Based upon review of single-case design and experimental studies involving use of self-monitoring strategies and reading interventions on comprehension and engagement for students with learning challenges and/or ASD (see chapter II), students' performances on reading comprehension outcomes and levels of engagement will increase when compared to a reading condition only treatment.

#### **Research Questions**

- 1. Does use of self-regulation plus reading intervention result in improved performance on reading comprehension probes for students with ASD when compared with a reading intervention only treatment?*
- 2. Does use of self-regulation plus reading intervention increase levels of engagement for students with ASD when compared with a reading only intervention?*

## **Research Design**

A single subject design using an alternating treatment with a baseline method was employed. Single-case design research focuses on an individual rather than a group; therefore, individuals are their own control group (Kennedy, 2005). An alternating treatment design was used to control for interference of sequential confounding, carryover, and alternation effects of treatment (Barlow & Hayes, 1979; Ulman & Sulzer-Azaroff, 1975). This design allows for concurrent or simultaneous application of two or more treatments in a single case (Barlow & Hayes, 1979). Randomization in blocks of two was used (e.g., A-B-A-B-B-A-A-B) in order to reduce potential carry-over effects (Kratochwill et al., 2010). No treatment condition occurred more than twice in a row.

## **Participants and Selection Criteria**

Participants were chosen based upon the following set of criteria: the student was in grade 5 through 8; the student was receiving Special Education services under the primary eligibility category of ASD; the student had at least one standardized subtest score greater than 85 SS as measured by the *Kaufman Brief Intelligence Test, Second Edition* (KBIT-2); the student had at a score >80 SS for sight word recognition based upon the Woodcock Johnson IV Achievement Test (WJ-IV ACH) Letter-Word Identification subtest; the student's reading comprehension was below average (<85 SS) based upon the WJ-IV Passage Comprehension subtest and/or the WJ-IV Reading Fluency subtest; and the student had at least one goal on their Individual Education Plan (IEP) targeting work completion, on-task behavior, or work avoidance.

Three participants were chosen based upon this criterion: Brad, Evan, and Neal (pseudo names). Once the participants were selected, permission slips were sent home and signed by both parents and participants (see Appendix L).

Brad was a 14-year-old Asian/Caucasian student in the 8<sup>th</sup> grade that read single, real words at a 3.0 grade level but comprehended short passages at a 2.3 grade level. He was first assessed for Special Education services by his local school district in July of 2018. He qualified for an IEP under the handicapping conditions of Autism and Speech and Language Impairment. He was also diagnosed with Autism by his pediatrician in July of 2018. His parents chose to enroll him at the NPS instead of attending public education. Within this setting, he received small group/one-on-one instruction and three hours of Applied Behavior Analysis (ABA) support on a daily basis. His Board-Certified Behavioral Analyst (BCBA) supervisor and Registered Behavior Technician (RBT) reported that he was extremely rigid with his schedule, often repeated/perseverated on topics of personal interest, struggled with cognitive shifting and internal monitoring, and had an individual behavior chart to track IEP/ABA behavior goals on a daily basis. Additionally, he received Speech and Language therapy and social skills training on a weekly basis. He was diagnosed with Lyme's Disease in Spring of 2021 and was under the care of a medical specialist. This diagnosis impacted his overall attention, engagement, and behavior according to doctor and parent reporting.

Evan was a 13-year-old Asian/Caucasian student in the 7<sup>th</sup> grade (retained) that read single, real words at a 9.6 grade level but comprehended short passages at a 5.5 grade level based upon the WJ-IV L-WI and PC subtests. He was diagnosed with Autism,

Attention Deficit Disorder, Oppositional Defiant Disorder, and Trichotillomania by various specialists at an early age. In addition to attending the NPS, he received district Speech and Language and Occupational Therapy, and social skills training on a weekly basis through the NPS. School staff reported that he was very motivated to please adults, complete his work, and follow the classroom token economy system for on-task work completion and behavior.

Neal was a 14-year-old Native American student in the 8<sup>th</sup> grade that read real words at an 8.2 grade level but comprehended short passages at a 3.1 grade level based upon the WJ-IV L-WI and PC subtests. He was first diagnosed with Autism at the age of seven years by his local district and was later diagnosed with a Specific Learning Disability in the areas of reading, writing, and math by the NPS. In addition to attending the NPS, he received ABA and social skills training on a weekly basis. School staff, including his BCBA and RBT, reported that he was extremely kind and compassionate but struggled with sustaining his focus and attention on non-preferred tasks, often became distracted by his own thoughts, and lacked tenacity when completing more difficult work. He experienced physical and mental fatigue on a fairly consistent basis. He had an individual behavior chart to track IEP and ABA behavior goals on a daily basis. See Table 3.1 for a summary of participant demographics.

### **Setting**

The study took place at a Non-public School (NPS) located in Southern California within a middle-class neighborhood. The NPS is a one-room classroom certified by the California Department of Education (CDE) for grades K-8 with a cap of 12 students per

certified Special Education teacher. The NPS is designed for students with a variety of learning disabilities, ADD, and high functioning ASD. Staff is experienced in designing and implementing behavioral supports using ABA techniques and academic remedial strategies. The classroom has one Special Education teacher, a Licensed Educational Psychologist, a Board-Certified Behavior Analyst (BCBA), and at least four Registered Behavior Technicians (RBTs) within the classroom as support staff at all times; therefore, the staff to student ratio within the classroom is at a minimum of 5 to 12. The classroom consists of 12 full time students with additional “push-in” ABA students throughout the day. At the time of the study, the class consisted of three girls and nine boys between the ages of seven and fourteen. Based upon the school intake forms filled out by parents or district IEPs, the class consisted of the following race/ethnicity groups: 42% Native American, 17% Caucasian, 17% Caucasian/Asian, 17% Caucasian/Hispanic, and 7% Hispanic. The sessions took place in a quiet room within individual sessions at the same time of day with the same instructor.

Specific student data was collected and reported as part of the study procedures including name, age, grade, and primary/secondary diagnosis (see Table 3.1).

*Table 3.1 Participant Demographics*

Participant	Age (yrs)	Grade	IEP (P/S)	Race/ethnicity
Brad	14.1	7.8	ASD/SLP	Asian/Caucasian
Evan	13.10	8.8	ASD/OHI	Asian/Caucasian
Neal	14.2	8.8	ASD/ADD	Native American

ASD = autism spectrum disorder; IEP = Individual Education Plan; P/S = primary/secondary handicapping condition; OHI = Other Health Impaired

## Measures

### *Participant Inclusion Measures*

**Reading Comprehension.** Three subtests were administered from the *Woodcock-Johnson-Fourth Addition Tests of Achievement* (WJ-IV ACH) prior to the start of the intervention: Letter-Word Identification (L-WI), Passage Comprehension (PC), and Reading Fluency (RF).

The WJ-IV Letter-Word Identification subtest is an untimed, individually administered assessment of identifying letters by name and reading real words presented in a list of increasing length and phonetic complexity. The Reading Fluency subtest is a timed test (three minutes). Students are asked to read a series of simple sentences and indicate if they are true or false by circling Y or N on the protocol. The WJ-IV Passage Comprehension subtest is an untimed, individually administered assessment of reading comprehension. The majority of items require a student to read given passages and then orally supply an appropriate missing word based on the context of the passage. The passages are fairly short and this is a cloze passage comprehension measure. The subtest consists of 52 items of increasing length and language complexity. Typically, this subtest takes approximately 15 minutes to administer. According to the authors (Schrank, Mather, McGrew, 2014), internal reliability for WJ-IV ACH untimed subtests (including Passage Comprehension) range from the acceptable to excellent range (.84 to .94).

**Cognitive Processing.** The KBIT-2 is a brief, individually administered test designed to measure a student's verbal (crystallized ability) and nonverbal (fluid reasoning) skills. It also provides a composite IQ score. The Verbal Scale assesses a



student's knowledge of words and their meanings and covers both receptive and expressive vocabulary. Additionally, it does not require reading or spelling skills. The Nonverbal Scale measures a student's ability to solve novel problems and complete analogies by using inductive and deductive reasoning skills. According to the authors (Kaufman & Nadeen, 2004), the test takes approximately 20 minutes to administer and is appropriate for ages 4 through 90. The authors reported mean split-half reliability scores across age groups as .91 for the Verbal Scale and .93 for the Composite IQ (see Table 4.1 for summary of performance on standardized descriptive measures).

### ***Primary Study Outcome Measures***

**Reading Comprehension.** In addition to the standardized measures used to select participants, the lead researcher created a Reading Rubric to measure reading comprehension outcomes. This rubric was used to measure proximal reading comprehension/main idea outcomes (primary outcome). The Rubric contained five questions/statements targeting the main idea and summarization of the individual passages: 1) *What was the most important who or what in this passage?*, 2) *What is the most important idea about that who or what?*, 3) *Tell me about the main idea about this reading.*, 4) *Tell me what happened at the beginning of the story.*, and 5) *Tell me what happened at the end of the story.* The rubric was used during baseline, reading intervention, and the measure of reading comprehension. However, it was only scored during baseline and the independent reading measure at the end of each session. (see Appendix A). Responses were independently scored by two IOA researchers based upon the Zoom recordings using a 0–2-point weighted scale.

**Engagement.** The lead researcher created a data sheet to record and analyze engagement data. The Behavioral Observation of Students in Schools (BOSS) tracking sheet contained 15 second interval recordings for the researchers to track on- and off-task behavior based upon these time intervals and video recordings (see Appendix I). Behavior data was collected during reading intervention only under both conditions.

### **Intervention**

Two independent variables were selected for this study: reading intervention only (RI) and reading intervention plus a self-monitoring strategy (RI + SM), which was compared by employing an alternating treatments single case design. Two dependent variables were measured based upon the causal relationship between the independent and the dependent variables (performance on reading comprehension/main idea reading rubric and student engagement time (both passive and active)).

A binder was created for each student which contained all the reading passages (see Appendix B), Reading Rubrics (see Appendix C), and Student Self-Monitoring Tracking Sheet (see Appendix D). The binder also contained an Intervention Schedule (see Appendix E), Daily Session Tracking Sheet (see Appendix F), BOSS Active and Passive Engaged Time descriptions (see Appendix G), Self-Monitoring Teacher Script (see Appendix H), and Teacher Self-Monitoring Reflection Script (see Appendix I). Additionally, the team members were provided with a copy of Pearson's Behavior Observation of Students in Schools (BOSS) Training Manual, one laptop, and access to a Zoom account used for daily video-taped sessions.

The source of reading passages implemented was *Quick Reads* (Hiebert, 2003), which are expository text passages. The passages used ranged between the 800 to 1000 Lexile levels (see sample in Appendix A). These materials contain six different readability levels (A-F). The pre-identified readability levels were determined from scores on the WJ-IV L-WI, WJ-RF, and/or the WJ-PC subtests by matching grade equivalent readability scores of each participant with equivalent difficulty level of the passages.

### ***Reading Intervention Only***

During the individual reading intervention only sessions, students were video-taped via Zoom recordings. After achieving an initial IOA agreement of 90%, the interventionists reviewed the reading intervention sessions on a daily basis and recorded both active (AET) and passive engaged time (PET) for each student using the BOSS tracking sheet (Appendix J). This will be described in greater detail within the “Training of Specialists” section. Observable behaviors of AET included writing, reading aloud, raising hand, talking to the teacher about the assigned material, or using instructional resources. PET behaviors included listening, looking at materials, silently reading, or being actively engaged with the instructor (direct eye contact was not necessary). The statistics (percentage of intervals in which the behavior occurred) were calculated using a calculator and double checked. The duration for each condition (RI or RI + SM) was set at 25 and 15 minutes, consecutively, and the interval for recording AET and PET was set at 15 seconds.

### ***Reading Intervention + Self-Monitoring***

Self-regulated learners assume increased responsibility for their own behavior and learning over time by strategically setting and planning to meet goals, monitoring and evaluating their progress, and using feedback to adjust their performance (Korinek & deFur, 2016). The following are target behaviors intended to increase academic performance: attending, participating, following directions, organizing, managing materials and time, and completing assignments (Carnahan, et al., 2009). Goal setting, self-management, self-monitoring, and self-evaluation are all components of a self-regulation strategy (Carnahan, et al., 2009).

For the purpose of this study, the following strategy was implemented in order to teach and model the use of the Self-Monitoring Tracking Sheet to the student participants. First, students engaged in personal goal setting and goal attainment activities specific to on-task behavior and academic performance. Second, the instructor taught and modeled expectations of reading intervention goals and expectations with participants. To ensure consistent implementation of these strategies, the researcher created a Self-Monitoring Teacher Script and a Self-Monitoring Reflection Script (see appendices G and H).

The intervention sessions took place four days per week within 30-minute sessions for four weeks. Additionally, the participants received individual instruction at the same time of day by the same instructor who did not provide any academic instruction to the participants prior to the start of the study. To further strengthen the rigor of the study, the two researchers who scored reading measures, collected IOA data and

completed the Implementation Validity Checklist (IVC) were not on-campus and did not have any interaction or background knowledge of the participants. Therefore, they had no preconceived ideas about how participants might respond or interpret their responses based upon previous interactions. The reading intervention included the following components: modeled passage fluency, question-answer relationships, and main idea summarization. Additionally, the instructor recorded on-task behaviors of the participants using scratch paper and provided specific praise and/or corrections for each observable behavior within the reflection portion of the self-monitoring worksheet. See Table 3.2 for schedule of each condition.

*Table 3.2 Schedule of Intervention*

<b>Activity</b>	<b>RI</b>	<b>RI + SM</b>
Expectations/ SM Teacher Script	0 minutes	5 minutes
Reading Intervention	25 minutes	15 minutes
SM Reflection Script/SMTS	0 minutes	5 minutes
Total Time	25 minutes	25 minutes

*Note:* RI = Reading Intervention; RI + SM= Reading Intervention + Self-monitoring; SMTS = Self-Monitoring Tracking Sheet; SM Teacher Script = Self-Monitoring Teacher Script; SM Reflection = Self-Monitoring Reflection Script

***Reading Intervention Only Steps of Implementation***

The following steps were implemented during each reading intervention only condition:

1. Select daily passage/condition in student’s binder (Daily Tracking Sheet).
2. Follow the schedule of intervention (noted above).

3. Open the Zoom account, locate the student's folder, start Zoom session, and make sure "record" is selected.
4. State the date, student's name, story passage number, and condition (RI or RI + SM).
5. Read the title of the passage selection.
6. Inform the student that after they read the passage, they will be asked to orally answer some questions about the passage.
7. Begin the lesson following the prompts provided in the teacher lesson copy (reading intervention). Read the passage interactively with the student (take turns reading, model fluency, ask questions regarding main idea and supporting details) as you read.
8. Upon completion of the reading, ask the student the first three questions on the Reading Rubric. If they do not respond correctly or succinctly, guide them towards the correct answer. They may refer back to the passage when responding.
9. Remove the passage from the student. Ask the last two questions from the Reading Rubric. Once again, if they respond incorrectly, guide them towards the correct response.
10. If time, complete a second intervention passage.
11. Present the second (or third) reading passage of the day to the student (measure). Ask them to read the passage either silently or out loud. Do not provide any input or feedback.
12. Ask the first three questions from the Reading Rubric. The student can refer back to the story for help but do not provide any assistance or guidance. Record their responses.
13. Remove the story from the student, ask the two remaining questions on the Reading Rubric. Record their responses.
14. Give the completed Reading Rubric to the lead researcher.

***Reading Intervention plus Self-monitoring Steps of Implementation***

The following steps were implemented during each reading intervention plus self-monitoring condition:

1. Select daily lesson/condition in student's binder (Daily Tracking Sheet).
2. Follow the schedule of intervention (noted above).
3. Open the Zoom account, locate the student's folder, start Zoom session, and make sure "record" is selected.
4. State the date, student's name, story passage number, and condition (RI or RI + SM).
5. Read the title of the selection.
6. Inform the student that today they will be using their Self-Monitoring Tracking Sheet, and after they fill it out and read the passage, they will be asked to orally answer some questions about the passage.
7. Read the Self-Monitoring Teacher Script.
8. Begin the lesson following the prompts provided in the teacher lesson copy (reading intervention). Read the passage interactively with the student (take turns reading, model fluency, ask questions regarding main idea and supporting details) as you read.
9. Upon completion of the reading, ask the student the first three questions on the Reading Rubric. If they do not respond correctly or succinctly, guide them towards the correct answer. They may refer back to the passage when responding.
10. Remove the passage from the student. Ask the last two questions from the Reading Rubric. Once again, if they respond incorrectly, guide them towards the correct response.
11. If time, complete a second intervention passage.
12. Read the Self-Monitoring Reflection Script and fill out the form with the student. Provide feedback/specific praise regarding your personal observations of the student's behavior.
13. Present the second (or third) reading passage of the day to the student (measure). Ask them to read the passage either silently or out loud. Do not provide any input or feedback.
14. Ask the first three questions from the Reading Rubric. The student can refer back to the story for help but do not provide any assistance or guidance. Record their responses.

15. Remove the story from the student, ask the two remaining questions on the Reading Rubric. Record their responses.
16. Give the completed Reading Rubric and Self-Monitoring Tracking Sheet to the lead researcher.

## **Training**

### *Evaluators*

The lead researcher selected one intervention instructor and two independent researchers to collect IOA and the Implementation Validity Checklist (IVC) data. The lead researcher, who has expertise in teaching direct reading instruction as well as specialized training in teaching students with ASD, conducted two three-hour professional development trainings with the instructor and independent evaluators. The professional development included the following components: overview and purpose of the study, training on explicit reading instruction, implementation of self-monitoring strategy, training on how to code active engaged time (AET), passive engaged time (PET), and off-task behavior using the BOSS Tracking Sheet based upon the video-taped Zoom sessions. The researcher provided weekly support sessions for the instructors using observation and feedback techniques.

### *Participants*

All participants received training regarding use of the self-monitoring checklist. This training took place prior to the start of the study and was maintained throughout each session which contained this independent variable. The training took place in three, 30-minute sessions by the lead researcher. The students were given a copy of the Self-monitoring Checklist, and each session focused on one aspect of the sheet. The first



training focused on goal setting. Topics covered included the following: 1) value of student's self-monitoring of their own behavior; 2) discuss and model the four target behaviors (paying attention, answering questions, asking or making on-topic questions/comments, and doing their best work); 3) how to score their Self-monitoring Checklist, and 4) how and when to mark "achieved" versus "not met" on their chart.

The second session of training focused on the self-management portion of the tracking sheet. After demonstrating an understanding of goal setting within the first training, the participants received instruction on the specific phrases "if not met, what distracted me," "if not met, what do I need to improve upon," and "if not met, what skill do I need to improve upon." Each of these phrases were explained, modeled, and practiced with each participant and instructor.

The last session focused on self-evaluation. Again, the students first received instruction on the value of self-evaluation. Next, they were given an overview of the reading intervention (e.g., reading of passages, how to identify the main "who" or "what" in the passage, what was the most important idea about that "who" or "what," and how to put those two ideas together to ascertain the "big idea" of the passage. Modeling and discussion took place regarding how to respond to the three self-evaluation questions: 1) *What part(s) of the lesson went well?* 2) *What part of the lesson was difficult?* and 3) *What part of the reading intervention do I want to improve next session?* Finally, through a mock reading instruction lesson, the students practiced filling out their personal Self-monitoring Checklist. These strategies were reviewed and students were reminded how to implement them throughout the intervention.

## **Procedures**

During the baseline phase, each participant read expository text passages which aligned with the preidentified readability level for each student. After reading the passage, the instructor read aloud the question prompts, recorded the student's verbal answers in written format, and recorded the sessions (visual and audio) via Zoom. During this phase, no prompting or instructional guidance was administered. This procedure took approximately ten minutes to administer.

After moving into the intervention phase, alternating treatments were randomly delivered in 30-minute sessions (see description below), four times weekly, for four weeks. In conjunction with evaluating potential relative effects of reading intervention plus self-monitoring compared to reading intervention only, the students' on-task behavior was measured under both conditions.

The intervention phase consisted of two different treatment conditions. During treatment one condition (RI), students were presented with a reading intervention which contained comprehension components and modeling of reading fluency. Under this condition, participants received 25 minutes of guided instruction. The instructor used a variety of strategies such as paired reading, vocabulary enrichment, and guiding the participant in how to find the main "who" or "what" and the main idea of that "who" or "what," and tying the two together for the overall main idea of the passage. Upon completion of this instruction, the interventionist provided the student with a new reading passage and asked them to read the passage independently (out loud or to themselves) and then orally answer the same five questions from the reading rubric. Their

performance on this story was used to measure the participant's reading comprehension (one of the primary dependent outcomes).

During condition two (RI + SM), students received the same reading intervention, but this time, they were given a personal self-regulation tracking sheet. During this condition, participants first received 5 minutes of self-monitoring intervention, then 15 minutes of reading intervention, then 5 minutes of self-monitoring intervention, and finally, 5 minutes to complete the independent reading measure. The self-regulation checklist was developed by the researcher and consisted of goals targeting the following four components: paying attention to the teacher, answering teacher questions, making on-topic questions/comments, and doing their best work during instruction. Additionally, the sheet contained three self-evaluation questions targeting what part of the session went well, what was difficult, and what part of the reading strategy needed improvement. During instruction, the instructor also tallied these observable behaviors and gave specific praise and/or correction for each one noted during the final reflection with the student.

For all participants, the order of treatment conditions was randomly assigned in blocks of two to ensure that no more than two consecutive sessions of the same treatment and an equal number of sessions per treatment were implemented. To randomize the sessions, the random team/group generator was used.

### ***Treatment Fidelity***

To ensure fidelity of treatment, the researcher created an Implementation Validity Checklist (IVC). The checklist included the following components: instructional procedures, use of student self-regulation check-list, and use of on-task behavior

observation checklist (see Appendix J). Additionally, the intervention was implemented by the same instructor at the same time of day for every session. All sessions were recorded via Zoom to measure fidelity of intervention implementation and interobserver agreement of the dependent measures. During recording, the interventionist and the participant sat on one side of a table, and the laptop was placed in front of them so that each person could be clearly seen. The record button was pushed as soon as the session started and was recorded in “the cloud” for later retrieval and analysis.

To determine fidelity of treatment, the lead researcher randomized at least 30% of intervention sessions for each condition (RI and RI + SM) for all three participants. Once the lessons had been randomly selected, the lead researcher informed the independent researchers which lessons to review. The same researchers who collected IOA data reviewed the selected video-recorded sessions, once again, and completed the IVC independently. Based upon individual scoring, all participants achieved 100% scores on the IVC for the RI treatment. Neal and Brad received 98.75%, and Evan received 100% for the RI + SM treatment. Based upon observational notes by the interventionists, the only area which was not followed 100% of opportunities was previewing the self-monitoring checklist prior to administering the reading intervention.

### ***Interobserver Agreement (IOA)***

Interobserver agreement (IOA) of dependent measures was conducted for 100% of the sessions by having two staff members independently score and compare the results of the Reading Rubric scores (dependent comprehension measure) and video recordings using the BOSS observation form (dependent engagement measure). Both item-by-item

and total scores were calculated daily by taking the total number of agreements divided by the total number of agreements and disagreements and multiplied by 100. Overall, IOA data was 94.6% when scored item by item and 96.5% when scored by total score for Evan. Overall, IOA data was 97.5% when scored item by item and 97.4% when scored by total score for Neal. Overall, IOA data was 94.5% when scored item by item and 96.5% when scored by total score for Brad. It is important to note that 14.8% of sessions needed to be rescored by the lead researcher and two staff members due to the poor quality of the Zoom recordings (e.g., student's prosody, rate of speech, volume, cluttering, turning away from the camera, and non-verbal responses).

The interventionists reviewed the Zoom sessions and recorded both active (AET) and passive engaged time (PET) in 15 second intervals for each student using the BOSS Observation Form (see Appendix E). Time count intervals were measured using an online timer set to beep every 15 seconds.

### ***Social Validity***

Wolf (1978) defined social validity as (a) the social significance of the goals of treatment; (b) the social appropriateness of the treatment procedures; and (c) the social importance of the effects of treatments. To determine the social validity of this study, participants (students and instructors) were asked to complete a researcher-designed six-point Likert-scale (see Appendix K) regarding the feasibility, usefulness, acceptability, and effectiveness of the intervention. The results of these questionnaires may be used to make decisions about current or future uses of the treatment and will be discussed in greater depth within Chapter 5.

### ***Data Analysis***

Single-subject design research may implement visual analysis of the data paired with non-regression analysis to gain a more comprehensive understanding of the intervention effects (Olive & Franco, 2007). Based upon WWC Single Case Design Handbook (Kratochwill, et al., 2010), six features can assess the effects of within- and between-phase data patterns: level, trend, variability, immediacy of the effect, overlap, and consistency of patterns across similar phases. According to WWC (2010), “level” refers to the mean score for the data within a phase. “Trend” refers to the slope of the best-fitting straight line for the data within a phase. “Variability” refers to the range or standard deviation of data about the best-fitting straight line. “Immediacy of the effect” refers to the change in level between the last three data points in one phase and the first three data points of the next. “Overlap” refers to the proportion of data from one phase that overlaps with data from the previous phase. Lastly, “consistency of data in similar phases” involves looking at data from all phases within the same condition and examining the extent to which there is consistency in the data patterns from phases within the same conditions.

Visual analysis was conducted by analyzing five of these six key features (level, trend, immediacy of the effect, overlap, and consistency of data patterns) for each individual participant and the results will be discussed in Chapter IV.

## CHAPTER IV RESULTS

Based upon the standardized assessments given prior to the start of the study (see Table 4.1), Brad evidenced the weakest reading skills; however, his comprehension proved weaker than his eidetic recognition of words. His nonverbal cognitive skills proved to be a strength. Evan's word identification proved to be much stronger than his comprehension of passages, and his overall cognitive abilities fell within average range with no substantial difference in subtest scores. Neal's eidetic recognition of words also proved to be more advanced than his passage comprehension. His nonverbal skills were found to be substantially stronger than his verbal abilities.

Table 4.1 *Standardized Descriptive Measures*

Participant	KBIT Verbal	KBIT Nonverbal	KBIT Composite	WJ-IV LWID	WJ-IV PC	WJ-IV RF
Brad	77	90	81	68	61	68
Evan	108	102	106	104	88	99
Neal	78	113	95	99	73	86

KBIT = Kaufman Brief Intelligence Test; WJ-IV LWID = Woodcock-Johnson Letter-Word Identification; WJ-IV = Woodcock-Johnson Passage Comprehension; WJ-IV RF = Woodcock-Johnson Reading Fluency; \*Reported as standard scores

### **Reading Comprehension**

#### *Visual Analysis*

The first research question sought to determine the effect of using self-regulation plus reading intervention on reading comprehension probes for students with ASD when compared with a reading intervention only treatment.

**Evan.** Evan's reading comprehension data are presented in Figure 1. The following analysis was conducted.

**Level.** During baseline, Evan's scores on the reading comprehension measure ranged from 50% to 90%, with a mean score of 62%. During intervention, his scores ranged between 70% to 100%, with a mean score of 95%.

**Trend.** Evan's trend line reveals an overall upward trend with two lower scores within baseline before moving into intervention. Once he transitioned into the intervention phase, his scores revealed an upward trend under both conditions, and he received performance scores of 90-100% for the last five opportunities of intervention.

**Immediacy of effect.** Based upon Evan's last three scores within baseline (90%, 50%, 60%) and his first three scores during intervention (70%, 90%, 80%), it can be concluded that a positive change in the outcome measure occurred. However, caution should be taken as this increase could be due to the "practice effect" and/or his interest in the individual stories.

**Overlap.** When compared to baseline, Evan achieved 28.6% overlapping data for both the reading intervention and reading intervention plus self-monitoring conditions.

**Consistency of data patterns across similar phases.** When comparing each phase and condition independently, Evan achieved a reading comprehension mean score of 62% during baseline and 95% during intervention under both conditions. Based upon these scores, Evan's comprehension proficiency increased under both conditions to the same degree. During both intervention conditions (RI and RI + SM), scores were consistently higher relative to baseline and never dropped below 80%.



**Neal.** Figure 1 illustrates Neal's percentage of correct responses on reading comprehension measures. The following analysis was conducted.

**Level.** During baseline, Neal's scores on the reading comprehension measure ranged from 20% to 50% with a mean score of 33%. During intervention, his scores ranged between 30% to 80% with a mean score of 54%. Based upon these scores, Neal's overall reading comprehension increased from baseline to intervention phase.

**Trend.** Neal's trend line reveals fluctuating performances. His overall comprehension increased, but his scores for RI evidenced a descending trend after moving to intervention with a spike at the very end of treatment. Under the RI + SM condition, he evidenced an ascending trend line, with one score falling below the mean score during session 9.

**Immediacy of effect.** Based upon his last three scores within baseline (20%, 50%, 40%), and his first three scores during intervention (50%, 80%, 30%), it can be concluded that no causal change in the outcome measure occurred based upon the manipulation of the independent variables. However, caution should be taken, once again, as his inconsistency of performance could be attributed to personal interest in the individual stories and his overall processing style.

**Overlap.** When compared to baseline, Neal achieved 60% overlapping data for the reading intervention only condition and 20% for the reading intervention plus self-monitoring condition; therefore, a compelling argument cannot be made for a causal effect for either condition.

Consistency of data patterns across similar phases. When comparing each phase and condition independently, Neal achieved a reading comprehension mean score of 33% during baseline and 54% during intervention under both conditions. Based upon these scores, Neal's proficiency increased under both intervention conditions (RI and RI + SM), but not to a substantial degree.

**Brad.** Figure 1 illustrates Brad's reading comprehension measure scores from the sessions conducted over the two phases of the study. The following analysis was conducted.

**Level.** During baseline, Brad's scores on the reading comprehension measure ranged from 0% to 50% with a mean of 30%. During intervention, his scores ranged between 30% to 60% with a mean score of 42.5% for RI and 40% for RI + SM. Based upon these scores, Brad's overall reading comprehension increased from baseline to intervention phases, but not to a substantial level.

**Trend.** Brad's trend line reveals fluctuating performances during baseline. His overall comprehension evidences an ascending trend for RI + SM, but his scores for RI evidenced a descending trend after moving to intervention with one spike during the second session of treatment. During intervention phase, Brad's reading comprehension measurement scores fluctuated, but he never received a score less than 30% for either condition as compared to 0% within baseline phase.

**Immediacy of effect.** Based upon his last three scores within baseline (20%, 30%, 40%), and his first three scores during intervention (40%, 30%, 60%), it can be concluded that no causal change in the outcome measure occurred based upon the manipulation of

the independent variables. However, caution should be taken, once again, as his inconsistency of performance could be attributed to personal interest in the individual stories and his overall processing style.

Overlap. When compared to baseline, Brad achieved 25% overlapping data for the RI condition and 28.6% for the RI + SM condition; therefore, a compelling argument cannot be made for a causal effect for either condition.

Consistency of data patterns across similar phases. When comparing each phase and condition independently, Brad achieved a reading comprehension mean score of 30% during baseline and 42.5% and 40% during RI and RI + SM conditions, respectively. Based upon these scores, Brad's proficiency increased under both intervention conditions (RI and RI + SM), but not to a substantial degree.

### **Engagement Behavior**

**Evan.** Figure 2 shows Evan's on-task engagement behavior data during both conditions of RI and RI + SM. During RI condition, Evan's occurrences of on-task engagement behavior ranged from 95% to 100% of session intervals, with a mean of 98%. His levels of on-task engagement behavior during RI + SM also proved to be quite high with a range from 96% to 100% of session intervals. Throughout intervention sessions, levels of on-task behavior continued to maintain high levels, and consistently reached 100% of intervals during both conditions by the end of the intervention. Differentiation between the two conditions (e.g., RI and RI + SM) was not observed, as Evan's levels of on-task behavior were commensurate during the RI (M = 98.9%) and RI + SM (M = 99.2) conditions.

**Neal.** Figure 2 also shows Neal's on-task engagement behavior data during both conditions of RI only and RI + SM. During RI condition, Neal's occurrences of on-task engagement behavior ranged from 95% to 100% of session intervals, with a mean of 98.6%. His levels of on-task engagement behavior proved to be slightly lower but still remained high during RI + SM. His scores ranged from 88% to 100% of session intervals, with a mean score of 94.2%. Throughout intervention sessions, levels of on-task behavior continued to maintain high levels and reached 100% of intervals during both conditions by the end of the intervention. Differentiation between the two conditions (e.g., RI and RI + SM) was not observed, as levels of Neal's on-task behavior were consistently high during the RI (M = 98.6%) and RI + SM (M = 94.2%) conditions.

**Brad.** Figure 2 shows Brad's on-task engagement behavior data during both conditions of RI only and RI + SM. During RI condition, Brad's occurrences of engagement behavior ranged from 75.5% to 100% of session intervals, with a mean of 92.7%. His levels of on-task engagement behavior remained fairly consistent during RI + SM and ranged from 88.5% to 95.5% of session intervals, with a mean score of 91.7%. Throughout intervention sessions, levels of on-task behavior continued to maintain high levels, but he only reached 100% of intervals during the very first RI session and 95.5% under the RI + SM condition. Differentiation between the two conditions (e.g., RI and RI + SM) was not observed, as levels of Brad's on-task behavior were consistently high during both the RI (M = 92.7%) and RI + SM (M = 91.7%) conditions.

In summary, occurrences of increased reading comprehension and on-task behaviors (e.g., paying attention to the instructor, trying their best, responding appropriately to questions) increased for all three participants upon implementation of RI and RI + SM, although to various degrees. However, Brad had one dip during session 4 for on-task engagement. Based upon the instructors notes and review of the video-taped session, he was hyper-focused on the start of recess as he was going to be late. This was the only data point that was not in alignment with the other scores, and should be considered as an anomaly as there was a 10% decrease from session 3 and a 12% increase for session 5.

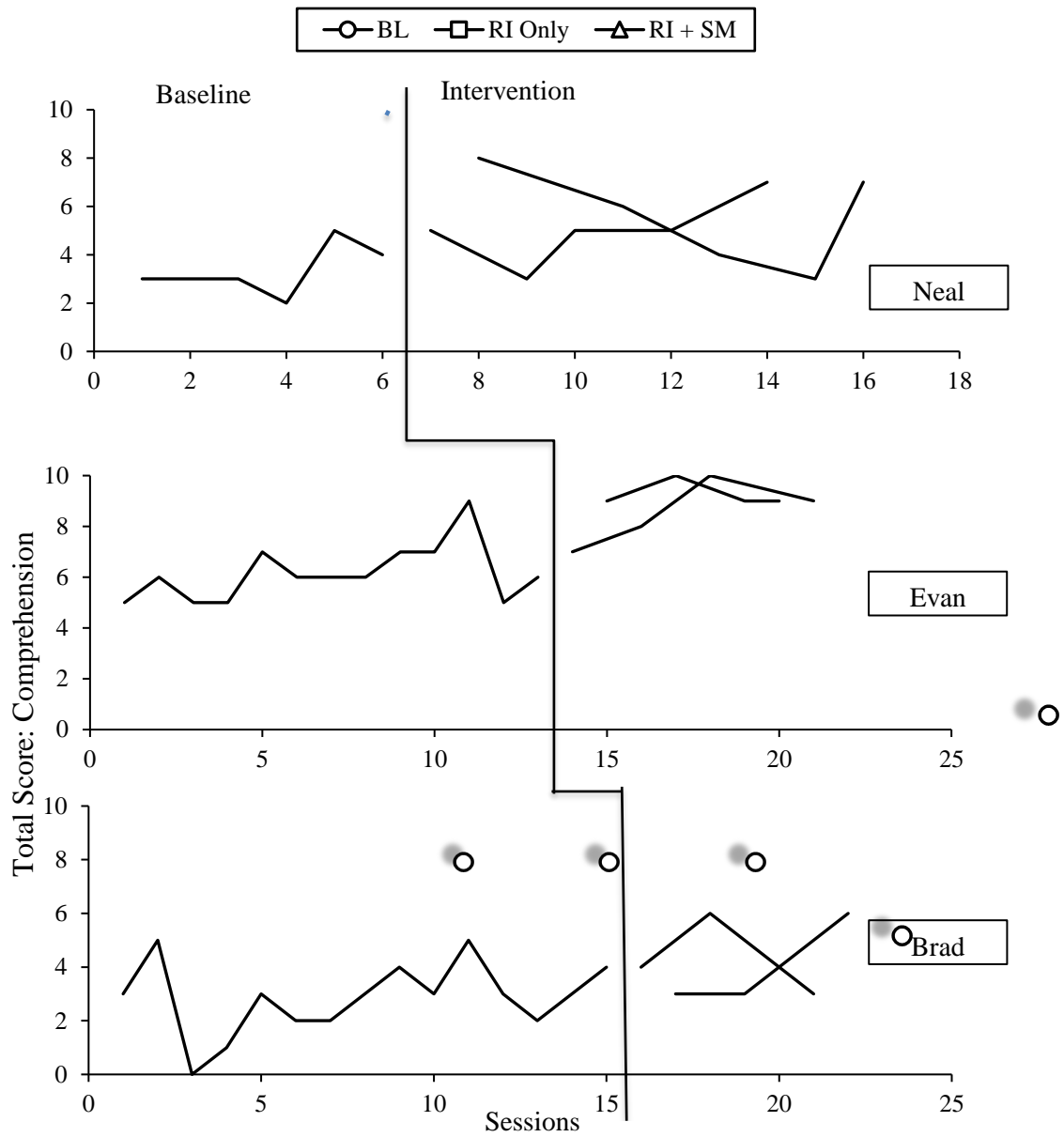


Figure 1: Reading Comprehension (RI and RI + SM Monitoring Scores)

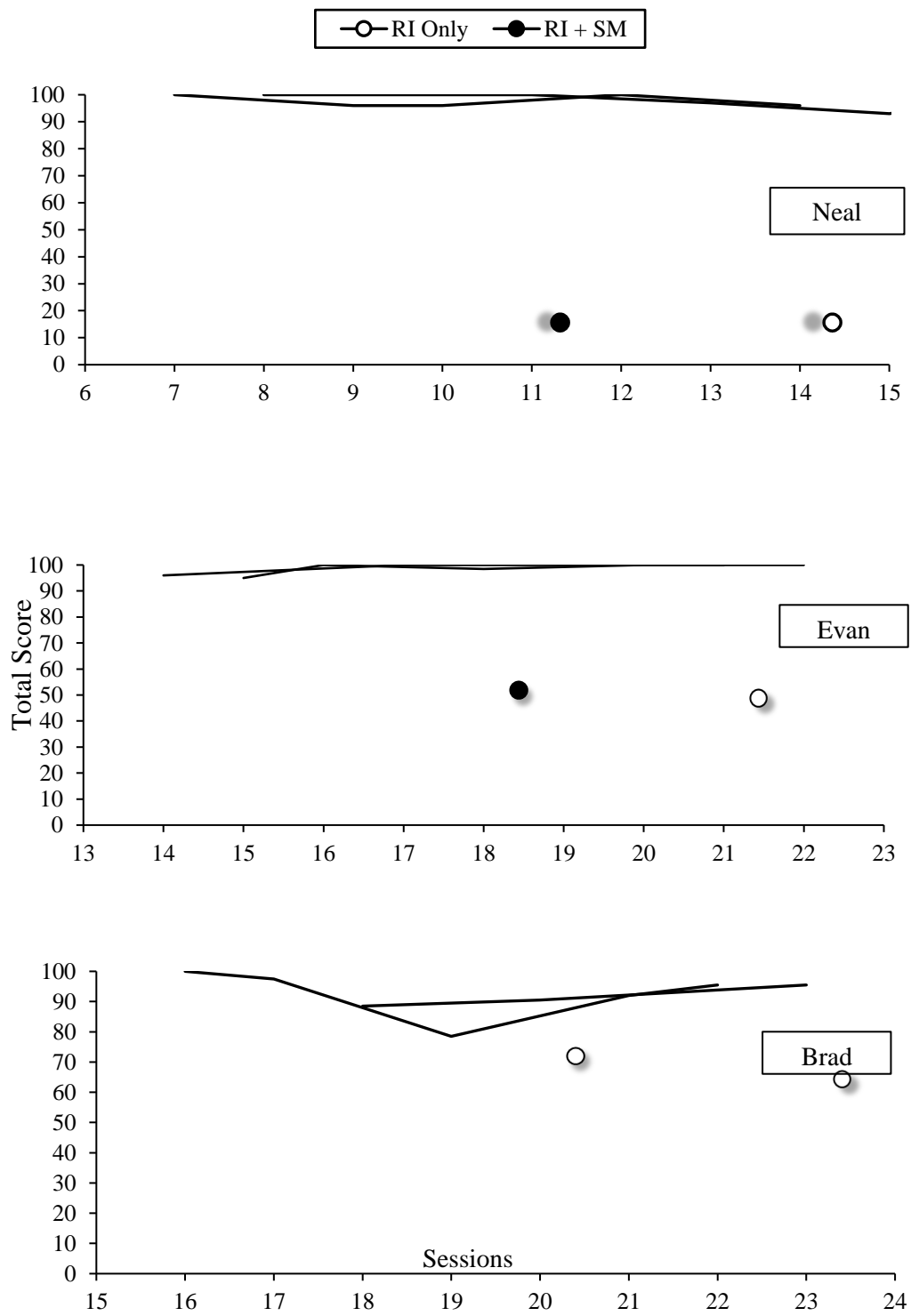


Figure 2: On-task Engagement (RI and RI + SM Monitoring Scores)

## CHAPTER V

### DISCUSSION

#### **General Discussion**

The emphasis in most classroom settings (both general and Special Education) is academic achievement, especially in the area of reading comprehension as students increase in grade level. Many students with ASD demonstrate strong eidetic recognition of single words but may struggle with reading comprehension and overall fluency for meaning (Chiang & Lin, 2008; Nation et al., 2006). Despite the significance of this problem, few intervention studies have addressed this particular issue involving students with ASD at the middle school level. Additionally, students with ASD are often disengaged from participating in the learning experience (Dunlap, 1999).

The purpose of this study was to evaluate the effectiveness of a reading intervention and self-monitoring components intended to increase reading comprehension of informational text and on-task engagement behavior for middle school students with ASD. This study was driven by three challenges many middle school students with ASD may face: reading comprehension deficits despite good decoding skills (Nation et al., 2006), lack of engagement when engaged in academic tasks (Dunlap, 1999), and the lack of studies conducted with middle school students on the spectrum (El Zein, et al., 2013). Findings from the present study demonstrated dissonant results on reading comprehension measures, but all three participants increased their overall mean comprehension scores. However, on-task engagement proved to be consistently high for all three participants during both conditions (RI and RI + SM).



Overall, Evan demonstrated the greatest and most consistent gains, demonstrating a functional relationship between the observed positive outcomes (e.g., reading comprehension gains, increased on-task engagement). During baseline, he achieved a mean score of 62% on the reading probes, and within treatment, he received mean scores of 92.5% (RI) and 85% (RI + SM). His on-task engagement was consistently high, and half-way through the treatment phase, he was achieving 100% engagement for both conditions. It is postulated that his strong scores relate to his overall learning aptitude based upon the KBIT-2 composite score (106 SS) and WJ-IV Letter-Word Identification score (104 SS). Additionally, he enjoyed the various reading passages as science and history are his favorite academic subjects. Prior to the study, he already had a wealth of background knowledge relating to the content of the passages. He was highly motivated to “do his best” as he wanted to make his teacher, the lead researcher, proud of him and ascertain positive outcomes for the study.

Neal evidenced an overall increase in mean reading comprehension scores from baseline (M = 33%) to RI condition (M = 54%) and RI + SM condition (M = 50%). However, his scores were not consistent and fluctuated throughout the treatment phase. Through observation, several factors appeared to impact Neal’s level of response accuracy. The individual story content and perseveration of thought seemed to have the greatest influence on reading outcomes. By his own comments, he liked some stories but others “made no sense.” During some sessions, even though he was trying very hard to pay attention, he was distracted by his own thoughts and perseverated on one aspect of the story rather than trying to grasp the gestalt. For example, one story was about the

three countries which make up North America, and he was very focused on *Canada* because he really wants to visit this country someday.

Based on measures obtained at the beginning of the study, Neal presents dissonant learning aptitude as measured by the KBIT-2. He displays strong fluid reasoning skills (113 SS) but reduced verbal or crystalized skills (78 SS). He evidences much stronger eidetic recognition of single words (99 SS) compared to his comprehension (73 SS) as measured by the Letter-Word Identification and Passage Comprehension subtests from the WJ-IV. Staff from the NPS also reported Neal displays variance in academic engagement and performance on a daily basis.

Although he has strong analytical skills, he struggles to express himself in a clear and concise way and often perseverates on certain topics or personal ideas. This pattern of behavior has been well documented within the literature for students with ASD, and Williamson, et al (2012) stated students with ASD struggle with relating to characters, integrating and synthesizing information, using social communication and are often hyper-focused on insignificant details rather than grasping the main idea of given text.

Brad also achieved an overall mean increase on comprehension measures from baseline (Mean = 30%) to both RI (M = 42.5%) and RI + SM (M = 40%) conditions. However, it was not substantial. This was not unexpected when his overall learning aptitude and standardized reading measures are taken into consideration. Based upon the KBIT-2, he achieved the following scores: Verbal (77 SS), Nonverbal (90), and Composite (81 SS). He achieved the following scores on the WJ-IV: Word-letter Identification (68 SS), Passage Comprehension (61 SS), and Reading Fluency (68 SS).

After administering the WJ-IV, the lead researcher was concerned about the reading recognition score as it was not commensurate with reported daily reading skills within the classroom setting. Error analysis on this measure indicated that Brad evidenced good sight word reading but struggled with words containing silent letters, more than three syllables, and ones that were not within his preferred topics of interest (e.g., Space). In reviewing the video-taped sessions, he often experienced this same difficulty and often read “right through” passages without monitoring his accuracy or overall understanding of the passages.

It is also important to note and review Brad’s ABA supervisor’s observational notes. Within the classroom, he is often extremely rigid with his schedule, often perseverates on topics of personal interest, struggles with cognitive shifting and internal monitoring, and has an individual daily behavior chart targeting these specific behavioral skills. During both treatment conditions, he attempted to stay focused and respond correctly to the main idea questions, but he still struggled to ascertain high, consistent scores. During the video-taped sessions, he was observed to perseverate on getting back to class by the start of recess, worrying about what he was missing based upon his traditional schedule, and tended to “talk through” all of the thoughts going through his head.

As with Neal, Brad evidences stronger fluid reasoning skills (90 SS) as compared to his verbal or crystalized skills (77 SS). While this behavioral pattern has been documented within past research for students with ASD (Williamson, et al., 2012), having the comorbid diagnoses of Lyme’s Disease, ADHD, and a Speech and Language

Impairment more than likely impacted his overall reading comprehension proficiency. It is postulated that if the reading intervention were to continue and set as part of his daily schedule, he would make greater gains over time.

As for the influence of self-monitoring component in both conditions, no clear differentiation between conditions was observed in terms of reading comprehension gains or increased on-task engagement for all three participants. Most of the reading comprehension data points from both treatment conditions (RI and RI + SM) overlapped, and the differentiation in engagement data points between both conditions was fairly consistent across participants. The overlap in data points between the conditions and the consistency of results across participants showed no clear advantage in favor of the self-monitoring condition.

Findings from this study indicate the reading intervention had a positive effect on reading comprehension outcomes for the three participants, although to different degrees. Specifically, mean scores for Evan, Neal, and Brad increased from baseline to treatment phases. Visual inspection of the graphs also indicated that there was evidence of improved performance in both conditions; however, two of the participants' scores fluctuated.

All three participants demonstrated high levels of on-task engagement behaviors under both RI and RI + SM conditions. However, caution should be taken when analyzing these scores as other factors more than likely impacted their high levels of on-task behavior. Therefore, a functional relationship cannot be determined. Please refer to limitations of the study for further comment and review.

All three participants were highly motivated to support the lead researcher, had daily behavior charts targeting on-task behavior prior to the start of the study, and the overall classroom behavioral management system was very consistent and supported by a token economy system. Of greater importance is the fact that the intervention took place in a one-on-one setting in a separate room with no other staff members or students in the room, which in itself supported on-task engagement and reduced distractibility.

Effective delivery of instruction is important for all students, but is critical for students with ASD. As mentioned in Chapter 1, students with ASD often exhibit challenging behaviors when academic tasks are presented, particularly those related to areas of skill deficit (e.g., reading comprehension). Additionally, they struggle with cognitive processing due to executive functioning and weak central coherence (Brown, Oram-Cardy, & Johnson, 2013; El Zein, Solis, Vaughn, & McCulley, 2013; Henderson, Clarke, & Snowling, 2011; Ricketts, et al., 2012; Wooley, 2016). Because all three participants struggled with grade level reading comprehension and engagement on a consistent basis across all academic subjects within the classroom setting prior to the start of the study (to various degrees), providing specific reading comprehension strategies proved promising based upon past research studies and overall analysis of the data.

### **Social Validation**

To determine participant information regarding perceived effectiveness of the RI and RI + SM interventions, a social validity questionnaire was administered to all three participants (see Appendix K). The questionnaire was administered after each participant completed their last intervention session. The questionnaire

contained a total of six questions that asked how much the participant enjoyed the reading sessions, how much the intervention helped them become a better reader, how much they enjoyed using the self-monitoring worksheet, did the self-monitoring worksheet improve their reading, and if they preferred using the self-monitoring worksheet or reading only sessions. These six questions asked the participant to score their responses using a Likert scale (1-5) with a follow-up, narrative response (*Please briefly explain your response.*). One last open-ended question was included, *Are there any other comments you would like to make regarding your overall impression of the intervention?* The participant could choose to give oral or written responses.

The social validity questionnaire revealed that after implementation of the RI and RI + SM interventions, the three participants' perceptions and attitudes towards the intervention were positive, and their overall reading skills improved. They enjoyed the individual instruction and receiving feedback on achieving daily goals. Overall, Neal rated the intervention as a "5," but he enjoyed the RI sessions more than RI + SM as he "got more time to read the passages." However, he also liked filling out the Self-Monitoring chart as he "got to know what he achieved." Evan rated the overall intervention as a "5" and felt his reading improved and enjoyed being one-on-one with the instructor. Brad also enjoyed the intervention, but could not choose his favorite condition. He loved spending time with the instructor. It is interesting to note that all three participants enjoyed the individual instruction and attention as well as discussing their behavioral accomplishments. While this was

deemed a limitation to the study, it should also be taken into consideration when designing remedial instruction for students with ASD in the future.

## **Conclusion**

This study brings research on reading comprehension intervention for students with ASD into a middle school setting, an area where limited research has been conducted (Scammacca et al., 2015). Although the positive outcomes observed upon implementation of RI and RI + SM proved to be inconsistent, all three participants demonstrated an increase in overall mean reading comprehension scores. Therefore, implementation of the intervention positively affected reading comprehension for these particular individuals with ASD. Further, outcomes were achieved in maintaining instances of on-task behaviors, which is also a positive finding as many students with ASD are often disengaged when presented with academic tasks that target deficit or non-preferred skills (e.g., reading comprehension). This is an important finding as research and instruction for students with ASD often focus on reducing challenging behaviors and teaching functional skills development (e.g., social interactions, adaptive behavior, and vocational skills) at the expense of academic performance (El Zein, 2014). Findings from this study demonstrate positive academic gains in the area of reading comprehension and engagement can be achieved for this population and should be researched in greater breadth and depth.

The purpose of this investigation was to investigate the effects of RI and RI +SM as previously described on reading comprehension and engagement behaviors; therefore, efforts were made to minimize the effects of confounding variables. As is true for all

students with disabilities, and even more critical for students on the spectrum, identification of individual interventions is imperative in order to achieve overall academic success.

### **Connection to Past and Future Research**

Based upon systematic reviews conducted by Chiang & Lin, (2008), El Zein et al., (2013), and Solis et al., (2012), findings from this study add to previous reading comprehension and self-monitoring intervention research for students with LD, ADD, and ASD.

Based upon the literature review of students with LD, ADD, and/or reading struggles, use of a multi-component self-monitoring strategy paired with reading intervention (Bruhn & Watt, 2013) improved academic engagement for two participants (comprehension measure was not included). Multiple studies examined use of self-monitoring paired with some type of reading intervention on reading comprehension. Three studies most closely aligned with the present study (Jitendra et al., 1998; Mason, 2004; Mason, 2006). Jitendra et al., (1998) determined use of main idea and summarization paired with self-monitoring improved overall comprehension. Mason (2004) and Mason (2006) ascertained use of the self-regulated strategy development PLANS (Pick goals, List ways to meet goals, And make Notes, and Sequence notes) paired with a cognitive comprehension strategy (Think before reading, think While reading, think After reading) resulted in positive gains in reading comprehension, memory of text, and oral retelling for all participants.



The present study adds to the existing literature and supports interventions proven to be effective with struggling readers, reading disabilities, and/or ADD may be modified to fit the needs of individual students on the spectrum and produce positive outcomes. The current study adds to the literature as no previous study was located that examined the interaction between use of a self-monitoring strategy paired with a reading intervention on both the comprehension and engagement of students with learning and behavioral challenges.

Based upon the literature review targeting reading comprehension and engagement for students with ASD, use of graphic organizers (Bethune & Wood; 2013; Stringfield et al., 2011), self-questioning techniques (Howorth, et al., 2016; Sanders, 2020; Whalon & Hanline, 2020), and behavior skills training (Sanders, 2020) paired with reading intervention resulted in positive reading comprehension gains.

Only two specific studies merit additional review and analysis (Drill & Bellini, 2021; and Solis et al., 2015) as they most closely align to the current study in the following aspects: both studies included all male participants with a primary diagnosis of high functioning ASD in grades 5-8, and both studies identified independent variables of self-monitoring and reading intervention with dependent measures of engagement and reading comprehension.

Solis et al., (2015) conducted a study regarding reading comprehension interventions using question development or anaphoric cuing supported with and without the behavioral component of ABA. Additionally, the team measured on and off-task

behavior under both conditions. Upon completion of the study and analysis, the authors determined that both question development and anaphoric cueing improved both the overall reading comprehension and on-task behavior for students with ASD.

Additionally, compared to the current study, the experiment took place in a one-on-one environment. However, the study took place within a public-school setting, which is dynamically different than the NPS the study took place. The participants' existing skills in the current study prior to the start of the intervention were more than likely commensurate with their true ability due to the make-up of the classroom (e.g., high staff to student ratio, individual and group behavioral supports in place targeting specific needs of the participants, established and practiced classroom expectations, and language enriched classroom between staff and students). Therefore, the gap between pre-existing skills and overall gains in reading comprehension and engagement were somewhat limited.

Drill & Bellini (2021) investigated the effects of combining three separate research-based interventions (Reader's Theatre, story mapping, video self-monitoring) into one succinct intervention on the narrative reading comprehension of three students. Additionally, the participants implemented a visual schedule, use of Character Story Event Map, and personal recordings of their acting out the Reader's Theatre to promote engagement and overall comprehension. When compared to the current study, the intervention took place on an individual basis but within the homes of the individuals rather than a school setting. Additionally, the reading materials were narrative, highly

motivating novels (*Harry Potter and the Sorcerer's Stone* and *Artemis Fowl*) as compared to expository, short passages used within the current study.

Overall, based upon the literature review and current studies, use of directed reading intervention and self-monitoring strategies for this population proves to be promising. However, more rigorous research needs to be conducted in this area. Specifically, for adolescents with high functioning ASD receiving instruction in both general and Special Education classrooms in small group settings as limited studies were located involving these independent and dependent variables and measures.

### **Limitations of the Study**

This dissertation study focused on reading comprehension and engagement for middle school students with ASD with average learning aptitude, which is an understudied area within the body of literature. Educators are called to provide evidenced-based instruction to all students (with and without exceptionalities) within their classrooms. Yet, many students with ASD struggle with reading comprehension and active, consistent engagement within the learning process. Therefore, further research is warranted for adolescents with ASD in the area of reading comprehension and engagement. Although this is a needed area of research, it is important to note limitations of the current study. First, the small sample size limits the generalizability of the findings. Although three participants is considered sufficient for single case design research, due to the unique behavior and processing style of individuals on the spectrum, it is difficult to make global, causal conclusions.

A second limitation of the study is the unique relationship between the lead researcher, who was also the classroom teacher, and the participants. Although the lead researcher did not conduct the intervention, the participants were highly motivated to do their best, and were very willing to contribute to the study. The purpose of this study was to fulfill the requirements of the lead researcher's doctoral degree completion, which they supported. This was fully explained and disclosed to the participants. More than likely, this served as a source of contamination that altered their typical behavior/effort within the classroom setting. Additionally, all three participants had been enrolled in the school for at least three years. They were familiar with the structure of the classroom, behavioral expectations, and embedded reward system. Additionally, they all had individual behavior plans in place targeting their unique challenges prior to the start of the intervention.

The location and group size also proved to be a significant limitation to the study. The intervention was provided one-on-one in a separate room with no other students present. Therefore, the environment itself supported the participants' ability to remain on-task and engaged with the instructor. Based upon staff reporting, Evan's engagement within his daily sessions has greatly increased over the past year, but is still contingent upon academic subject and interest in the topic being presented. Neal's engagement proves to be quite dissonant, and he struggles to maintain his focus and attention during small group instruction based upon daily ABA data (three or more students). Brad's engagement during intervention conditions proved to achieve the greatest gains based upon his daily ABA data within the classroom setting. Within daily sessions, he is

typically on-task for a total of 63% of opportunities when engaged in small group instruction. Within treatment conditions during the study, he was engaged for 92.7% of opportunities for RI and 91.7% opportunities for RI + SM conditions.

Next, Evan had a significant advantage as he presented a wealth of background knowledge regarding the passages presented to him prior to the start of the study. However, in analyzing his responses, he became more succinct and confident with his answers by the end of the study.

Lastly, more than likely a “bleeding effect” took place between the two conditions.

### **Implications for Practice and Research**

This study suggests that in some circumstances, it is not necessary to add a self-monitoring component to a reading comprehension intervention, especially if the intervention is conducted in a one-on-one setting, within a separate location outside of the classroom, and free from distractions. Despite the limitations of the study, all participants achieved positive gains in comprehension, but not on a consistent or statistical basis. The main idea instruction supported their ability to organize their thoughts, focus on relevant details, while grasping the gestalt of the story. The self-monitoring checklist and instructor feedback did not support their ability to become more actively involved in the learning process based upon analysis of the data. Engagement was high across both conditions. It is postulated that the one-on-one instruction paired with individual motivation of the students to perform to the best of their ability due to their relationship with the lead researcher impacted the overall results. These variables within the study

more than likely were enough to keep engagement levels high, and the additional components of SM were not necessary. Although unintentional, this finding should be revisited for future research and practice as it appears delivery of instruction (one-on-one), setting (separate room with minimal distractions), and overall teacher/student relationship may have the greatest impact on academic and behavioral outcomes for students with ASD. Additionally, having these environmental factors in place, allows for more room to practice necessary reading skills.

Additionally, receiving specific feedback as to *what* they did correctly and *what* needed improvement, increased their confidence and willingness to participate in reading intervention, which is important for students with ASD based upon the literature. It is postulated that if educators apply these techniques within a variety of classroom settings, positive outcomes will occur. However, more research is needed to assess the generalizability of the findings and to replicate these findings in different settings. Specifically, within small groups and increased number of participants.

## Appendix A

### Reading Rubric

READING RUBRIC				
<b>Name:</b>	<b>Lesson:</b>	<b>Date:</b>		
<b>Condition:</b>	<input type="checkbox"/> RI	<input type="checkbox"/> RI + SM	<input type="checkbox"/> Baseline	
<b>Passage:</b>	<input type="checkbox"/> Measurement			
<b>Evaluator:</b>	<input type="checkbox"/> Instructor	<input type="checkbox"/> IOA Initials _____		
<b>Score:</b>	CH _____	ML _____	LH _____	Final _____
Prompt/Question	Scoring Rubric			
*a correct answer does not necessarily have to be the example response				
Q1 What was the most important who or what in this passage?	0- Does not answer or provides incorrect answer 1- Provides answer that is partially correct 2- Provides correct answer			
Q2 What is the most important idea about that who or what?	0- Does not answer or provides incorrect answer 1- Provides answer that is partially correct, but may be incomplete 2- Provides complete, correct answer that shows adequate detail			
Q3 Tell me the main idea about this reading?	0- Does not answer or provides a response that is not indicative of the main idea of the passage 1- Provides main idea that is partially correct, but may lack specificity or not combine information from Q 1-2 2- Provides complete, correct answer that shows grasp of main idea of the section; combines information from Q 1-2			
Q4 Tell me what happened at the beginning of the story.	0- Does not answer or provides incorrect answer 1- Provides a brief response within the first paragraph. 2- Provides a detailed response within the first paragraph.			
Q5 Tell me what happened at the end of the story.	0- Does not answer or provides incorrect answer 1- Provides a brief response within the last paragraph. 2- Provides a detailed response within the last paragraph.			

## Appendix B

### Reading Material Example

Reading Comprehension	
Tutor Lesson Plan	Student Instructional Materials
<p><b>Main Idea Summarization</b></p> <ul style="list-style-type: none"> <li>• Model fluent reading; student listens.</li> <li>• Complete guided reading with the student.</li> <li>• Select and ask one of the following questions for each section of the text:               <ul style="list-style-type: none"> <li>○ <i>What is this paragraph about? What is the most important idea? Tell me the most important idea in this part? What is the main idea?</i></li> </ul> </li> </ul> <p><b>Sample Correct Response:</b></p> <ul style="list-style-type: none"> <li>❖ <i>Avocados are in demand across the world and prices are higher.</i></li> </ul> <p><b>Feedback Procedure:</b></p> <ul style="list-style-type: none"> <li>❖ <i>Let's practice and re-read ____ of the passage.</i></li> <li>❖ <i>Reduce the quantity of text read and provide scaffolds.</i></li> <li>❖ <i>Re-ask the questions and discuss.</i></li> </ul>	<p style="text-align: center;"><b>Avocados in Demand</b></p> <p>People across the world love avocados. From tacos to toast, people are eating it on everything. Now, the fruit's prices are at an all-time high. There has even been an increase in avocado-related crime. Recently, three men were arrested for selling off more than \$300,000 worth of Hass avocados. "Avocados are very subject to theft," says Mary Lu Arpaia (ar-pie-uh). She is a plant scientist and expert avocado breeder that works at the University of California at Riverside.</p> <p>Such tales are not surprising considering that the fruit is high in demand. The average American eats seven pounds of avocados each year. According to the U.S. Department of Agriculture, the number of avocados eaten in the country has tripled since the early 2000s. Nearly all of these are Hass avocados. This kind of avocado did not even exist a hundred years ago.</p>



## Appendix C

Name: \_\_\_\_\_

Date: \_\_\_\_\_

### Self-Monitoring Tracking Sheet

Goal Setting	Self-Monitoring	Self-Management
Goal 1: <i>I will pay attention to my teacher.</i>	Achieved  Not Met	If not met, what distracted me?
Goal 2: <i>I will answer my teacher's questions.</i>	Achieved  Not Met	If not met, what do I need to improve upon?
Goal 3: <i>I will ask on-topic questions or make on-topic statements.</i>	Achieved  Not Met	If not met, what do I need to improve upon?
Goal 4: <i>I will do my best work during my reading session.</i>	Achieved  Not Met	If not met, what skill do I need to improve upon?
<b>Self-Evaluation/Reflection</b>		
What part(s) of the lesson went well?	<b>Teacher:</b>  <b>Student:</b>	
What part(s) of the lesson was difficult?	<b>Teacher:</b>  <b>Student:</b>	
What part of the reading intervention do I want to improve upon next session?	<b>Teacher:</b>  <b>Student:</b>	

## Appendix D

### Intervention Schedule

RI	IOA	Action	RI + SM	IOA	Action
Expectations	None	None	Review of SM Behaviors w/Script	IVC	C/M-scan and email to Leslie end of study
Intervention Passage 1 w/ Questions	IVC <del>Eng-BOSS</del>	C/M-scan and email BOSS OTS to Leslie daily	Intervention Passage 1 w/Questions	<del>Eng-BOSS</del>	C/M-scan and email BOSS OTS to Leslie daily
Intervention Passage 2 w/Questions	<del>Eng-BOSS</del>	C/M-scan and email BOSS OTS to Leslie daily	Reflection of SM Behaviors w/Script Student fills out SM Checklist Terri-provides student feedback +/-	IVC	C/M-scan and email to Leslie end of study
Measure Passage 3	None	Student reads to himself or out loud	Measure Passage 2	None	Student reads to himself or out loud
Reading Rubric Questions Terri-asks and records oral responses in written format on Rubric	Read Comp Score	Terri-gives to Leslie daily Leslie-scans and emails to C/M as "back-up" C/M watch video, score Rubric, scan results, and email to Leslie daily	Reading Rubric Questions Terri-asks and records oral responses in written format on Rubric	Read Comp Score	Terri-gives to Leslie daily Leslie-scans and emails to C/M as a "back-up" C/M-watch video, score Rubric, scan results, and email to Leslie daily
			Reading Passage 3 -if time		

## Appendix E

Date	Daily Session #	Type of Intervention	Passage 1	Passage 2	Passage 3	NOTES
	1	Reading ONLY BL	Lesson 6	Lesson 5		
	2	Reading ONLY BL	Lesson 30	Lesson 43		
	3	Reading Only BL	Lesson 8	Lesson 46		
	4	Reading + Behavior	Lesson 14	Lesson 25	Lesson 22	
	5	Reading ONLY	Lesson 45	Lesson 10	Lesson 23	
	6	Reading + Behavior	Lesson 18	Lesson 26	Lesson 1	
	7	Reading + Behavior	Lesson 49	Lesson 22	Lesson 2	
	8	Reading ONLY	Lesson 15	Lesson 33	Lesson 9	
	9	Reading + Behavior	Lesson 37	Lesson 16	Lesson 3	
	10	Reading ONLY	Lesson 35	Lesson 31	Lesson 10	
	11	Reading + Behavior	Lesson 40	Lesson 20	Lesson 11	

## Appendix F

### BOSS Active and Passive Engaged Time

Active Engaged Time (AET) is defined as:

Student is actively attending to the assigned work.

Examples of AET include:

- a) Writing
- b) Reading aloud
- c) Raising a hand
- d) Talking to the teacher about the assigned material
- e) Talking to a peer about the assigned material
- f) Looking up a word in a dictionary

Passive engaged time (PET) is defined as:

Student is passively attending to assigned work.

Examples of PET include:

- a) Listening to a lecture
- b) Looking at an academic worksheet
- c) Silently reading assigned material
- d) Looking at the blackboard during teacher instruction
- e) Listening to a peer respond to a question

### BOSS Nonengagement Time

Off-task Engagement is defined as:

Student is not being engaged in academic behavior.

Examples of student off-task behavior:

- a) Motor (OFT-M)
  - a. Off-task motor behaviors (OFT-M) are defined as any instance of motor activity that are not directly associated with an assigned academic task.
    - i. Examples:
      1. Engaging in any out-of-seat behavior (defined as buttocks not in contact with the seat)
      2. Aimlessly flipping the pages of a book
      3. Manipulating objects not related to the academic task (e.g., playing with a paper clip, throwing paper, twirling a pencil, folding paper)

4. Physically touching another student when not related to an academic task.
5. Bending or reaching, such as picking up a pencil on the floor
6. Drawing or writing not related to an assigned academic activity
7. Turning around in seat, oriented away from the classroom instruction
8. Fidgeting in seat (i.e., engaging in repetitive motor movements for at least 3 consecutive seconds) while not on task

### b) Verbal (OFT-V)

a. Off-task verbal behaviors (OFT-V) are defined as any audible verbalizations that are not permitted and/or are not related to an assigned academic task.

i. Examples of OFT-V include:

1. Making any audible sound, such as whistling, humming, forced burping
2. Talking to another student about issues unrelated to an assigned academic task
3. Talking to another student about an assigned academic task when such talk is prohibited by the teacher
4. Making unauthorized comments or remarks
5. Calling out answers to academic problems when the teacher has not specifically asked for an answer or permitted such behavior

### c) Physical (OFT-P)

a. Off-task passive behaviors (OFT-P) are defined as those times when a student is passively not attending to an assigned academic activity for a period of at least 3 consecutive seconds.

i. Examples of OFT-P:

1. Student is quietly waiting after the completion of an assigned task, but is not engaged in an activity sitting quietly in an unassigned activity
2. Looking around the room
3. Staring out the window
4. Passively listening to other students talk about issues unrelated to the assigned academic activity

## Appendix G

### Self-Monitoring Teacher Script

Good morning. Today we are going to work on our reading lesson while using our self-monitoring checklist.

First, let's review our goals.

- 1) I will pay attention to my teacher.
  - a. What does this mean?
    - i. I will look in the direction of my teacher (direct eye contact not necessary).
    - ii. I will listen to instruction.
    - iii. I will not be distracted by my own thoughts, items in my environment, or sounds within my environment.
- 2) I will answer all of my teacher's questions.
  - a. What does this mean?
    - i. I will listen to the question being asked of me and give my best answer based upon the lesson being taught.
- 3) I will ask on-topic questions or make on-topic statements.
  - a. What does this mean?
    - i. I will ask questions relating to the passage that was read.
    - ii. I will not give my own personal opinion about the passage that was read.
    - iii. I will not ask or talk about ideas that I am thinking about that are not related to the passage being read.
- 4) I will do my best work during my reading session.
  - a. What does this mean?
    - i. I will try to answer every question.
    - ii. I will ask for help if I do not understand.
    - iii. I will not give random guesses.
    - iv. I will not say, "I don't know." without thinking about possible solutions to the question/request first.

Good job. Now we are ready to practice our reading comprehension. You will fill out your self-monitoring chart after we complete the instructional lesson.

## Appendix H

### Self-Monitoring Reflection Script

(Administer after reading intervention has taken place.)

Now that we are done with our reading lesson, let's review and fill out the self-monitoring checklist.

First, let's review your goals and then please fill out your sheet. Spelling does not count and you do not need to write in complete sentences.

- 1) I paid attention to my teacher.
- 2) I answered all of my teacher's questions.
- 3) I asked on-topic questions or made on-topic statements.
- 4) I did my best work during my reading session.

Good job. Now we are ready to reflect on how well you think you did during the lesson and how well I thought you were actively participating.

*Depending on the student, the tutor can provide feedback first or after the student has shared their own reflection.*

While you were working, I noticed you did the following things very well (x, y, z). What do you think you did well during the lesson?

While you were working, I noticed that (x, y, z) was somewhat difficult for you. What do you think was difficult in today's lesson?

While you were working, I noticed that you could improve upon (x, y, z) for tomorrow's lesson. What do you think you could improve upon?

Great job filling out your chart honestly and completely. Now you will read a reading passage on your own. After you are finished reading (out loud or to yourself), I will ask you the same five comprehension questions that I asked for passage #1.

## Appendix I

### BOSS

<b>Name:</b>	<b>Lesson:</b>	<b>Date:</b>		
<b>Condition:</b>	<input type="checkbox"/> RI	<input type="checkbox"/> RI + SM	<input type="checkbox"/> Baseline	
<b>Passage:</b>	<input type="checkbox"/> Intervention			
<b>Evaluator:</b>	<input type="checkbox"/> Instructor	<input type="checkbox"/> IOA Initials _____		
<b>Score:</b>	CH _____	ML _____	LH _____	Final _____

Moment	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
\$ On Task																
\$ OFT-M																
\$ OFT-V																
\$ OFT-P																

Notes:

Moment	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Total
\$ On Task																
\$ OFT-M																
\$ OFT-V																
\$ OFT-P																

Notes:

Moment	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	Total
\$ On Task																
\$ OFT-M																
\$ OFT-V																
\$ OFT-P																

Notes:

Moment	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	Total
\$ On Task																
\$ OFT-M																
\$ OFT-V																
\$ OFT-P																

## Appendix J

Name: \_\_\_\_\_ Evaluator: \_\_\_\_\_ Lesson #s \_\_\_\_\_ Date: \_\_\_\_\_



### Implementation Validity Checklist

Self-monitoring Sheet	
<input type="checkbox"/>	SM1. Tutor presented the self-monitoring sheet using SM Teacher Script.
<input type="checkbox"/>	SM2. Brief review of Goal 1 – I will pay attention to my teacher.
<input type="checkbox"/>	SM3. Brief review of Goal 2 – I will answer all of my teacher’s questions.
<input type="checkbox"/>	SM4. Brief review of Goal 3 - I will ask on-topic questions or make on-topic statements.
<input type="checkbox"/>	SM5. Brief review of Goal 4 - I will do my best work during my reading session.
Reading Intervention	
<input type="checkbox"/>	DIMS1. Tutor modeled fluent reading of <i>Quick Reads</i> passage #1.
<input type="checkbox"/>	DIMS2. Tutor and student completed guided reading of passage #1 for the session.
<input type="checkbox"/>	DIMS3. Tutor asked student main idea question prompt(s).
<input type="checkbox"/>	DIMS4. Tutor provided specific affirmative and/or corrective feedback to the student for main idea answers.
<input type="checkbox"/>	DIMS5. Tutor asked student to show/say the evidence in the sentence OR the passage to justify answer.
<input type="checkbox"/>	DIMS6. Tutor and student reread passage #1 together OR started reading passage #2.
<input type="checkbox"/>	DIMS7. Tutor tallied student observable self-monitoring behaviors during instruction.
Self-monitoring Feedback	
<input type="checkbox"/>	SMF1. Tutor presented the self-monitoring sheet using the SM Reflection Script.
<input type="checkbox"/>	SMF2. Tutor guided the student to fill out the self-monitoring chart goal #1.
<input type="checkbox"/>	SMF3. Tutor guided the student to fill out the self-monitoring chart goal #2.
<input type="checkbox"/>	SMF4. Tutor guided the student to fill out the self-monitoring chart goal #3.
<input type="checkbox"/>	SMF5. Tutor guided the student to fill out the self-monitoring chart goal #4.
<input type="checkbox"/>	SMF6. Tutor guided the student to fill out the self-evaluation/reflection – What went well?
<input type="checkbox"/>	SMF7. Tutor guided the student to fill out the self-evaluation/reflection – What was difficult?
<input type="checkbox"/>	SMF8. Tutor guided the student to fill out the self-evaluation/reflection – What do I need to improve?
<input type="checkbox"/>	SMF9. Tutor provided specific praise/correction regarding observable target goal behaviors from tally marks during instruction.
IVC Score	
<input type="checkbox"/>	RI + SM Total Completed = <span style="background-color: #90ee90; display: inline-block; width: 20px; height: 15px;"></span> / 21 possible = Percentage: <span style="background-color: #90ee90; display: inline-block; width: 20px; height: 15px;"></span>
<input type="checkbox"/>	RI Only Total Completed = <span style="background-color: #90ee90; display: inline-block; width: 20px; height: 15px;"></span> / 7 = Percentage: <span style="background-color: #90ee90; display: inline-block; width: 20px; height: 15px;"></span>

Global Indicators				
	High Quality		Low Quality	
<b>G1. INST Overall, I consider the teacher’s quality of instruction to be:</b>	⊙ 4	⊙ 3	⊙ 2	⊙ 1
<b>G2. IMP Overall, the teacher’s adherence to implementation of the intervention to be: *scored is based on IVC percentage</b>	⊙ 4 85%-100%	⊙ 3 70%-84%	⊙ 2 50%-69%	⊙ 1 0%-49%
Global Indicatory Score				
: Total out of 8	: Percentage			

Note. For a definition of teacher’s quality of instruction see “quality indicators and descriptors rubric.”



## Appendix K

### Social Validity Survey

Researcher \_\_\_\_\_ Student Name \_\_\_\_\_ Date \_\_\_\_\_

1 = not at all true 2= a little bit true 3= sometimes true  
4= very true 5= always true

1. On a scale of 1-5, how much did you enjoy the reading sessions?

1 2 3 4 5

Please briefly explain your response.

2. On a scale of 1-5, how much did the reading sessions help you become a better reader?

1 2 3 4 5

Please briefly explain your response.

3. On a scale of 1-5, how much did you enjoy using the self-monitoring worksheet?

1 2 3 4 5

Please briefly explain your response.

4. On a scale of 1-5, do you think using the self-monitoring sheet improved your ability to engage in the reading sessions with better focus?

1 2 3 4 5

Please briefly explain your response.

5. On a scale of 1-5, did you prefer the reading sessions only?

1 2 3 4 5

6. On a scale of 1-5, did you prefer the reading sessions plus use of the self-monitoring sheet more?

1 2 3 4 5

Please briefly explain why you liked one condition more than the other.

7. Are there any other comments you would like to make regarding your overall impression of the intervention?

## Appendix L

### Reading Interventions Research Study

Dear Parent,

My name is Dr. Michael Solis and I am conducting a research study in your child's class. I am interested in studying about and developing reading interventions for children with Autism Spectrum Disorder (ASD).

Your child has been selected for participation in a research study that is investigating a reading intervention for students with ASD. All activities related to the study will be offered through in-person learning. First, we will administer a brief battery of reading and cognitive assessments to your child. This battery will take about 90 minutes to complete. To avoid fatigue, the battery will be completed in three half-hour sessions over a one week time period. The school personnel administering the assessment will attend extensive training prior to the testing session and will collaborate with your child's teacher to make sure all testing accommodations are followed. Your child will be allowed to take breaks throughout the testing sessions. If at any point your child no longer wants to continue with testing because of any discomfort the testing session will stop.

The research school personnel will consist of employees from Big Springs that will be trained and supervised by the Principal Investigator of the study. Children selected for the reading intervention will receive one on one instruction in the areas of reading understanding and on task behavior for 30 minutes 4 days a week for 6 weeks. All sessions will be conducted in a one-on-one environment. Children will learn reading strategies to identify main-idea summarization, make inferences, and understand connections within text. Your child will be allowed to take breaks throughout the reading sessions. If at any point your child no longer wants to continue with instruction because of any discomfort the instruction session will stop.

For purposes of learning more about the reading instruction, we will videotape and audiotape all instruction via Zoom. Members of the research team will review the Zoom sessions to learn more about how the instruction worked. Nobody else will have access to the recordings.

This is not a paid study, and no monetary compensation will be given to parents, students, or school site.

If you have any questions or concerns about the study, or if you would like to withdraw your child from the study, please contact me at:

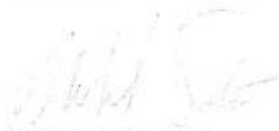
Michael Solis, Ph.D.



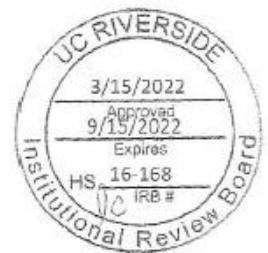
Associate Professor of Special Education  
University of California Riverside  
900 University Ave.  
Riverside, CA 92521  
Phone - (951) 827-5225, cell - (928) 310-2866  
Email - michael.solis@ucr.edu

If you have questions about your rights or complaints as a research subject, please contact the IRB Chairperson at (951) 827 - 4802 during business hours, or to contact them by email at [irb@ucr.edu](mailto:irb@ucr.edu).

Sincerely,



Michael Solis, Ph.D.



**Project Title: Reading Enhancements for Students with Autism Spectrum Disorders**

**Parent/Guardian Informed Consent Agreement**

Please read this consent agreement carefully before you decide to participate in the study. Your child will also receive an assent form; please review the assent form with your child.

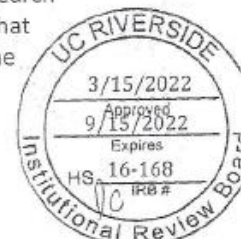
**Purpose of the research study:** The purpose of this study, Reading Enhancements for students with Autism spectrum Disorders (**Project READ**), is to develop an innovative reading comprehension intervention (tutoring) for students with Autism spectrum disorders (ASD) in grades 4 – 8 who display adequate word reading skills and low reading comprehension. The Project READ intervention is designed to specifically address the reading comprehension difficulties of students with ASD.

**What your child will do in the study:** All activities related to the study will be provided through in-person learning. School personnel will work one to one to administer a battery of reading and cognitive assessments to your child. This battery will take about 90 minutes to complete. To avoid fatigue, the battery will be completed in three half-hour sessions to be completed over one week. The school personnel administering the assessment will attend extensive training prior to the testing session and will collaborate with your child’s teacher to make sure all testing accommodations are followed. Your child will be allowed to take breaks throughout testing sessions. If at any point your child no longer wants to continue with testing because of any discomfort the testing session will stop.

When students participate in the one on one reading tutoring, we will work with school personnel to find a time to provide this instruction in addition to their current reading instruction. Students who choose not to participate will continue participation in the school-based educational programming. Trained school personnel will provide reading instruction as part of an experimental study. Students will learn reading strategies to identify main-idea summarization, make inferences, understand connections within text, and on task behavior. For purposes of learning more about the reading instruction, we will videotape and audiotape all sessions through Zoom. The recorded sessions will only be reviewed by members of the research team to learn more about how the instruction worked and will be stored in a safe place. Your child will be allowed to take breaks throughout tutoring sessions. If at any point your child no longer wants to continue with testing because of any discomfort the testing session will stop. No compensation will be provided for participation.

**Time required:** The study will require 90 minutes of testing and 14 hours of one-on-one reading instruction provided by school personnel. We will provide 30 minutes of one-to-one reading sessions 4 days a week for 28 sessions total.

**Risks:** There are no anticipated risks in this study. Risks of involvement in this research project are no greater than risks in everyday life. If at any time a situation arises that presents a physical or psychological danger to the child, teacher, or researcher, the session will be ended.



**Project Title: Reading Enhancements for Students with Autism Spectrum Disorders**

**Benefits:** There are no direct benefits to you or your child for participating in this research study. The study may help us understand improvement in academic performance, and decrease in challenging behavior. The results of any assessments and reading interventions will be made available to teachers and parents/ guardians free of charge. This research also potentially benefits the greater society by adding to the research literature base of effective, evidence-based assessment and instructional procedures.

**Confidentiality:** The information that your child provides during the study will be handled confidentially. Your child's information and your information will be assigned a code number. The list connecting your child's name and your name to this code will be kept in a locked file in a locked office. When the study is completed and the data have been analyzed, this list will be destroyed. Your child's name and your name will not be used in any report. The assessment data will be retained in a secure file cabinet for a period of 5 years after which it will be destroyed.

**Voluntary participation:** Your child's participation in the study is completely voluntary. Your child's grades will not be affected by the study.

**Right to withdraw from the study:** You have the right to withdraw your child from the study at any time without penalty. If you withdraw your child from the study all data of assessment and instruction will be destroyed.

**How to withdraw from the study:**

If your child wants to withdraw from the study, the researchers should be notified. There is no penalty for withdrawing.

**Payment:** You will receive no payment for participating in the study.

**If you have questions about the study, contact:**

Michael Solis, Ph.D.  
Assistant Professor of Special Education  
University of California Riverside  
900 University Ave.  
Riverside, CA 92521  
Phone - (951) 827-5225, cell – (928) 310-2866  
Email – michael.solis@ucr.edu

If you have questions about your rights or complaints as a research subject, please contact the IRB Chairperson at [\(951\) 827 - 4802](tel:9518274802) during business hours, or to contact them by email at [irb@ucr.edu](mailto:irb@ucr.edu)





**Project Title: Reading Enhancements for Students with Autism Spectrum Disorders**

**Agreement:**

I agree to allow my child to participate in the research study described above.

**Signature:** \_\_\_\_\_ **Date:**

**Printed Name:** \_\_\_\_\_

**Student Name:** \_\_\_\_\_

You will receive a copy of this form for your records



### Informed Assent Agreement

**Please read this assent agreement with your parent(s) or guardian(s) before you decide to participate in the study. Your parent or guardian will also give permission to let you participate in the study.**

We want to learn about how to better assist students with reading instruction

As part of our study, we would like to ask you to participate in reading instruction and to complete tests in reading. Each test takes between 5 – 15 minutes to complete. All the tests will take about two hours to complete and you can have breaks between activities. A trained instructor from your school will provide you with reading instruction that should help you to better understand what you are reading. You will work by yourself with the instructor for 30 minutes per day for 6 weeks on reading instruction. During the reading instruction, we will video or audio record the sessions so that we can learn more about how the instructor worked with you. We will work with your teacher to make sure you don't miss important parts of your school day. The entire study will take about 16 hours to complete. If you choose not to participate in the study you will participate in your regularly scheduled class activities.

We don't think that there are any risks to you in this study. If you participate in this study, you may learn some ways that will help you to better understand what you are reading. The information that you give us during this study will be kept private. Your name will not be used and the list linking the code name assigned to your real name will be destroyed after all the information is collected so no one who reads about our study will know it was you. We keep things locked up so that only our researchers see them. After 5 years all the information will be destroyed including the audio files.

You don't have to participate in this study. If you choose not to participate in the study your grades will not be affected. If you choose to participate and change your mind at any time during the study the video/audio tapes of your instructional sessions and any information that you already gave us will be destroyed. You can stop participating in the study at any time and this will not affect your class grades. If you want to stop doing the study, tell Michael Solis from the University of California Riverside or the school instructor that will be working with you. There is no penalty for stopping.

You won't receive any money if you do the study.

**If you have questions about the study, contact:**

Michael Solis, Ph.D.  
Assistant Professor, Graduate School of Education  
University of California Riverside  
900 University Ave.  
Riverside, CA 92521  
Telephone: 951-827-5225



### Reading Tutoring Research Study

Dear Student,

My name is Michael Solis and I work at the University of California Riverside. I am conducting a research study so I can learn more about reading instruction for children.

We want to learn about strategies that help you become a better reader and stay on task. People from the school will give you tests in person so we can learn more about your reading skills. The tests will take about 90 minutes to complete and will be administered in three half-hour sessions. You will be allowed to take breaks, so you don't get tired. If at any point you want to stop taking the tests, let the people from the school know and the testing session will stop.

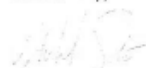
After the tests, you will participate in a reading tutoring provided by instructors from the school. We will work with your teacher to find a good time to provide the reading tutoring. This way you don't miss important parts of your school. You will learn reading strategies to help you better understand what you are reading. We will audiotape and videotape instruction using Zoom so we can review it and learn more. You will be allowed to take breaks if you ever get tired. If at any point you don't want to participate because you are not comfortable then the reading instruction will stop.

If you have any questions or concerns about the study, or if you don't want to participate please tell your teacher or contact me at:

Michael Solis, Ph.D.  
Assistant Professor, Graduate School of Education  
University of California Riverside  
900 University Ave.  
Riverside, CA 92521  
Telephone: 951-827-5225  
Email: Michael.solis@ucr.edu

If you have questions about your rights or complaints as a research subject, please contact the IRB Chairperson at [\(951\) 827-4802](tel:9518274802) during business hours, or to contact them by email at [irb@ucr.edu](mailto:irb@ucr.edu).

Sincerely,



Michael Solis, Ph.D.





Email: Michael.solis@ucr.edu

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**Agreement:**

I agree to participate in the research study described above.

**Student Name**

**Printed:** \_\_\_\_\_

**Student Signature:** \_\_\_\_\_

**Date:** \_\_\_\_\_

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