

The Effects of Executive Functions in Children with ADHD and the  
Impact on Their Literacy Development

Nicole Pettrone

The College at Brockport State University of New York

## Chapter 1

### **Introduction:**

“Human beings have built in capacity to meet challenges and accomplish goals through the use of high-level cognitive functions called executive skills” (Dawson & Guare, 2010, p.1). As humans, we are all born with the capacity of building upon executive functions. However, not all humans develop executive skills at the same rate and/or may have some type of interference with the development of their executive skills. One of the interfering factors of executive functioning development is known to be Attention Deficit/Hyperactive Disorder. Biederman, Monuteaux, Doyle, Seidman, Wilens, Ferrero, Morgan & Faraone (2004), have established that, “An emerging literature has repeatedly documented that children with ADHD exhibit executive function deficits” (p.757).

### **Problem Statement:**

Students with attention deficit/ hyperactivity disorder are at heightened risk for developing executive functions at a much slower rate than their peers develop or have executive function deficits. These executive function deficits have been proven to take a toll on students’ academic performance. So I explored the impact that executive function deficits have on children with ADHD’s literacy development as well as how teachers can employ techniques to help these students.

### **Significance of the Problem**

Pennington and Ozonoff (1996) concluded, “Children with ADHD consistently exhibit worse performance on certain cognitive and EF measures” (p.80). Over the past couple of years,

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

we have seen an increase in children being diagnosed with ADHD that means there is also an increase in possible executive function deficits within our students. By conducting this research, I wanted to provide myself, and others, with the tools to increase children's executive functions and academic performance.

### **Purpose of the Study/ Research Questions**

The purpose of this study was to explore and examine students who are diagnosed with ADHD and how executive functions effect their literacy development in their regular classroom and how teachers can employ techniques and strategies to help bridge this gap. The goal of my research was to use this information to more effectively understand and support students with ADHD in their educational settings and to offer opportunities to help prompt executive functions in these students in areas where they may lack the necessary skills. Furthermore, I hope my research will help inform other teachers of the affect ADHD may have on children executive functions and provide them with some techniques and strategies that they can use within their classroom. Therefore, my research questions are as follows:

1. What executive function deficits are affecting students with ADHD? Is there a specific executive function that students with ADHD lack?
2. What are some strategies that can be implemented by teachers to prompt the given executive function deficit?
3. How is an executive function deficit affecting children's schoolwork?

I hypothesize that working memory and sustained attention are two major executive functions that have the biggest educational impact on students with ADHD.

**Rationale**

There is an interesting reason to pursue research in this area. In all probability, teachers will have at least one student throughout their teaching career in their classroom that has been diagnosed with ADHD. Developing an understanding of the ways ADHD effects students, like executive function deficit, will allow teachers to provide them with the strategies and tools to help overcome their deficits.

As a general education and special education teacher, it is my job to provide students with the best education possible. In doing this, I need to understand my students strengths and limitations as learners and help develop techniques and strategies for them to overcome those limitations. My goal as a teacher is for each one of my students to grow and succeed in the world. In accomplishing this goal, it is essential to help them find ways to overcome the obstacles they may face.

**Study Approach**

This study was grounded around a qualitative research design. Clark and Creswell (2010) describe qualitative research as, “research conducted to explore research problems by collecting text and image data to understand participants’ views about a research problem” (p.234). The grounded theory research design refers to a design that researchers use when they want to generate a general explanation that will clarify a process, action or interaction among people (p.240). In this case, I explored the effects that ADHD has on a child’s development of executive functions in literacy development. I manufactured an explanation as to the process and actions a student with ADHD takes within the classroom instruction.

This study is grounded in an educational and cognitive theoretical framework that examines the academic and mental abilities of students. I theorized that working memory and sustained attention would have the biggest impact on a student's literacy development. Sustained attention refers to the "capacity to maintain attention to a situation or task in spite of distractibility, fatigue, or boredom" (Dawson & Guare, 2010, p. 39). The diagnosis of ADHD is due to trouble staying focused or lack of sustained attention. Working memory refers to "the ability to hold information in mind while performing complex tasks. It incorporates the ability to draw on past learning or experience to apply to the situation at hand or to project into the future" (p.1). Throughout my research, I refer to Lee Vygotsky's theory, tools of the mind. Vygotsky believed, "just as physical tools extend our physical abilities, mental tools extend our mental abilities, enabling us to solve problems and create solutions in the modern world" (Tools of the Mind, 2014). In other words, he deems that until students learn these tools of the mind, their learning is mainly dependent on their surrounding environments. Without the mental tools of sustained attention and working memory, cognitive abilities that students with ADHD may lack, their academic abilities will be affected.

## **Chapter 2: Literature Review**

### **Introduction**

Executive function is a diverse topic and can affect humans in a variety of life situations. My main goal was to develop an understanding of how executive functions affect students in their academic performance and to apply techniques and strategies that can help bridge that gap of any executive functioning deficits. In examining other literature and research studies that have already been conducted, I am trying to gain a sense of knowledge and understanding on this

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

topic. Throughout this chapter, I examine studies conducted that explore how executive function academically affects students with ADHD and the effects of working memory and short-term memory deficits in students with ADHD. Additionally, I research strategies that have been implemented to help students cope with ADHD and executive function deficits.

### **The Academic Effect of Executive Function Deficits in Student's with ADHD**

As I looked into executive functioning and how it affects students with ADHD and their academic development, I found numerous studies to support my theory of the role executive functions play in students' academic achievement. Most researchers have found results that link students with ADHD to an increased risk of poor academic performance due to executive function deficits.

Biederman, Monuteaux, Doyle, Seidman, Wilens, Ferrero, Morgan and Faraone (2004) conducted a research study based around the impact of executive function deficits in students with ADHD and their academic performance. They looked at the relationship between executive functioning and functional outcomes in a population of young children and adolescents with ADHD. The participants included both male and female children with ADHD (259) and without ADHD (222). The results showed that students with executive functioning deficits (EFD) had an increased risk for grade retention and a decrease in academic achievement.

The authors used a variety of assessments in testing their hypothesis. They examined each participant in a psychiatric, psychological, cognitive and neuropsychological assessment. In addition, they also divided their participants into four controlled groups due to the wide variety in age differences.

As a result of their research, Biederman, Monuteaux, etc, (2004) found that, “children and adolescents with ADHD with and without EFD’s performed worse than control participants on achievement scores and measures of school functioning” (p.761). In every assessed outcome, it was found that students with ADHD academically performed much poorer than students without ADHD. The authors further assessed academic performance that included only participants with ADHD. Their findings included that, “ADHD + EFD participants were over 2 times more likely to repeat a grade compared to ADHD- EFD participants” (p.761). The authors recommend that further studies should examine adults with ADHD and EFD to understand the full impact of EFD beyond academic performance.

Fuhs, Nesbitt, Farran and Dong conducted another research study that looked at academic performance and achievement related to executive functions. The authors conducted a study that looked at the longitudinal association between executive functioning and academic performance. Their study contained 562 four-year old Pre-K children and followed them through Kindergarten to test them on six aspects of executive functioning and five subtests of the Woodcock-Johnson III. The participants were from four different rural and semi-urban communities. The authors goal was to distinguish if children’s “executive function skills predict academic skills across the transition from pre-k to kindergarten and do the associations between executive functioning and achievement vary by academic content areas”. In addition, the authors examined the bidirectional association between executive functioning and academic skill gains. The participants were assessed twice in pre-k and twice in kindergarten.

The authors use the Woodcock-Johnson III within their study to determine the academic achievement throughout the two years. The Woodcock-Johnson III is a series of subtests that have been proven valid and reliable. Five of the subtests from the Woodcock-Johnson III were

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

used to examine outcomes related to mathematical concepts, language and literacy. In addition to the Woodcock-Johnson III, Fuhs, Nesbitt, Ferran and Dong used the backward digit span, the copy design task, the dimensional change card and the head-toes-knees-shoulders task to assess students for executive function deficits and academic performance.

Results showed the importance and relationship of effective executive function gains and the achievement of academic skills. When the authors examined and analyzed the data, they were able to find that executive functions at the beginning of pre-k foretell academic achievement throughout all content areas. The authors concluded that, “this study suggests that EF skills may promote the development of early mathematical and oral comprehension skills at a time when children are transitioning to a more formal schooling environment in which academic skills development is an important part of their day” (Fuhs, Nesbitt, Farran & Dong, 2014, p. 1708). Although this research study did not hone in on students with ADHD, the authors still proved the importance and significance that executive functions can play in the success of academic performance for all students.

Krajewski and Schneider (2009) examined the importance of phonological awareness working memory and quantity-number competencies being measured in kindergarten students. With the measures of kindergarten students within these categories, they are able to predict these students school mathematical achievement in third grade. This study consisted of 108 preschoolers both male and female, 55 girls and 53 boys. The authors used a wide range of tests to look at the different aspects of executive function. The authors used what is known as a digit span forward and digit span backwards. These tests looked at phonological loop and central executives. In addition, they also used visual-spatial sketchpad and the Corsi block task. These two assessments are common assessments that many researchers use in order to look at executive

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

functions. The authors also gave the students an intelligence test known as the Culture Fair Intelligence Test.

The authors concluded that “Individual differences in phonological awareness and the visual-spatial sketchpad influence the development of math competencies from an early point in time onward” (531). Krajewski and Schneider’s results are consistent with other authors who have used similar tests on students with ADHD and executive functions. They recommend that teachers start coaching student’s on phonological awareness at an early stage to decrease students that are at risk for executive functioning deficits.

These studies support the theory that executive functions play a role in students with ADHD’s literacy development. It is important to understand where the students executive function deficits lay and how it is affecting them academically. As teachers, we can help our students overcome their deficits and be successful in their education.

### **The effects of working memory and short-term memory deficits in students with ADHD**

Throughout my research, I found multiple research studies that are related to working memory and short-term memory, which are two executive functions, and its effect on students with ADHD. As stated earlier in chapter one, working memory refers to, “the ability to hold information in mind while performing complex tasks. It incorporates the ability to draw on past learning or experience to apply to the situation at hand or to project into the future (Dawson & Guare, 2010, p. 1). According to Wikipedia, short-term memory is, “the capacity for holding a small amount of information in an active, readily available state for a short period of time”. As I hypothesize that working memory would be one contributor having a large impact on students with ADHD and their literacy development, this research has further supported my hypothesis.

Rebecca Bull, Kimberly Espy and Sandra Wiebe conducted a study called *Short-Term Memory, Working Memory, and Executive Functioning in Preschoolers: Longitudinal Predictors of Mathematical Achievement at Age 7 Years* (2008). This study used a variety of executive functioning assessments with a population of preschoolers and worked with the participants through third grade. The authors used four local nurseries that were linked with a nearby primary school.

The authors used a variety of assessments throughout their research in order to gain their data. They tested the participants using the Performance Indicators in Primary School (PIPS) three different times, The Shape School, the Tower of London, the Corsi Blocks and the Digit Span assessments. Their goals were to discover whether measures of short-term memory, working memory and executive functioning in preschool children predict later proficiency in academic achievement. Their testing on the Corsi Block and Digit Span were eliminated in their result analysis due to the validity of their collection in the preschool year.

The findings showed ultimately all, “Cognitive skills assessed correlate significantly with academic achievement.”(Bull, Espy & Wiebe, 2008, p.220). They were able to conclude that all cognitive skills that were assessed throughout this study, connected drastically with both mathematics and reading achievement. However, their analyses of their data pointed to visual-spatial short-term memory span being the most significant executive function affected in academic growth. Bull, Espy and Wiebe recommend the use of visual sketchpads in the primary grades due to their analysis that students rely heavily on visual-spatial representations to help with their short-term memory.

Bull, Espy and Wiebe’s research helped me with my research in a significant way. Their research focused on students in the age group of four through eight where mine targets students

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

seven-eleven. Their study provided me with valid background knowledge linking executive functioning and academic achievement. It provided me with reasonable explanations of what could have caused the EFD in my research study population.

Another study that was carried out by Garcia-Madruga, Vila, Gomez-Veiga, Duque & Elosua (2014) was called *Executive Processes, Reading Comprehension, Academic Achievement in 3<sup>rd</sup> Grade Primary Students*. This study evaluates, “how working memory’s executive processes and fluid intelligence are affected in a sample of 3<sup>rd</sup> grade primary school students” (p.42). The participant samples consisted of 70 third-grade students (40 girls and 30 boys). The selected participants were all from a middle-class socio-economic group in the Madrid area.

Throughout the author’s research, there were three working memory tests conducted and a reading comprehension test. The students were tested in two different sessions; the first session was the reading comprehension test which lasted approximately 30 minutes. The second session was completing all three working memory tests and an intelligence test which lasted about 70 minutes. The three working memory tests consisted of an analogy test, a semantic updating test and a visual-spatial test.

As a result of this research study, the authors discovered that semantics, updating and analogies and fluid intelligence all correlate with reading measures and academic achievement. Additionally, after they analyzed the reading comprehension test, it was confirmed that working memory and fluid intelligence predict reading comprehension components. Furthermore, they believe that, “working memory plays a central role in several other domains of cognition, including writing, arithmetic and problem solving” (p.41).

Major and Martinussen (2011) researched the impact that ADHD can have on student’s executive function of working-memory. The authors state, “Importantly, evidence

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

suggest that students with ADHD with EF deficits display lower levels of academic functioning than their peers without ADHD, and students with ADHD without EF deficits” (p.69). It is believed that working memory is also linked to inattentive behavior in students with ADHD. When students feel overloaded with demands on working memory, students act out. “To support students with working memory weaknesses, teachers can adjust the instructional context, provide students with external supports to reduce working memory load, and teach students specific strategies to promote goal-oriented behavior” (p.70).

The authors suggest that teachers use a variety of approaches to help reduce the demand put on working memory within the classroom. One suggestion is to scaffold complex and multistep tasks. We, as teachers, should break down multistep directions into chunks for students with ADHD and executive function deficits. They also suggest scaffolding for organization and time management. To address these concerns of organization and time management among students, we can provide checklists and give explicit instructions for students

A working memory deficit can play a huge role in students overall academic achievement. These studies are just three of many research studies that discovered the impact working memory and short-term memory play on a student’s academic achievement.

### **Strategies That Help Students with ADHD Who Have Executive Function Deficits**

As teachers, it is important to not only recognize students who struggle with executive function deficits but also identify strategies and techniques that help bridge that gap for the student. There are a variety of strategies and techniques that teachers can employ with their students with ADHD and executive functioning deficits. Implementing strategies into student’s

classroom activities is done through trial and error. Strategies and techniques may work for some students and have little to no effect on other students.

Christopher Kaufman (2010) describes seven core strategies that can be used to help students with executive function deficits in his book *Executive Function in the Classroom* (p.81-93). The seven core strategies he describes are:

1. Provide children with executive function weaknesses with the “surrogate prefrontal lobe” support they need. Student’s prefrontal lobe, where the executive function skills lay, is still developing. For those with executive function deficits, they need an increased support system to rely on. We need to “provide the level and duration of surrogate frontal lobe support (e.g., adult supervision, instructional scaffolds, social mentoring) required for success” (p.81).
2. Teach new skills and content systematically and explicitly. It is important to explicitly teach new skills and content because students with executive function deficits often struggle with unfamiliar tasks. With explicit instruction, teachers can reduce the students’ confusion and frustration.
3. Teach strategies and explicitly demonstrate the manner in which they should be applied in real-life learning context. Students with executive function deficits may have a difficult time with appropriate strategies to apply to a situation. Kaufman suggests that we need to explicitly demonstrate the “ability to survey a problem situation and determine the strategies needed to address it” (p.84).
4. Minimize demands on working memory (limit simultaneous processing load). Working memory helps us to hold-on to information and it relies on comprehension and storing this information. Students with weak working memory may only be able to hold-on to,

comprehend and store so much information. It is important that instructions are given in a minimal way to students with weak working memory.

5. Provide many opportunities for guided, extended practice. This strategy helps build fluency for students and helps them recall facts. “As students develop some level of mastery over a given content area or skill, the self-directed cognition that had been directed toward it can be devoted to other problems” (Kaufman, 2010, p.88).
6. Keep things as predictable and consistent as possible. Kaufman believes that consistency is key in developing self-regulation in students with executive function deficits. He describes this skill as easing the burden for students with executive skill weaknesses (p.90).
7. Anticipate the aspects of task and situations students might find threatening or frustrating, and model strategies to manage these challenges when they occur. It is suggested that in order to increase students executive skills, it is essential for teachers to make an effort in keeping anxiety, frustration and stress level as low as possible. One way to do this is for the teacher to explicitly instruct the student on a task that may cause frustration and model ways to manage their difficulty.

These seven core strategies that Kaufman describes are both preventions of executive functions deficits and interventions for students who already have executive functioning deficits.

Peg Dawson and Richard Guare (2010) further developed strategies and interventions to help promote executive skills. Dawson and Guare (2010) believe the first step in developing strategies and interventions to promote executive functions is to “think about ways to change the environment to adjust to their limitations” (p.50). The authors indicate that teachers should change any external factors that may be affecting the child’s executive functions in a negative

way. This may mean physical or social, changing the nature of the tasks that are expected of the child, changing the way cues are provided to prompt the child, or changing the way people interact with the child. (p.50-51).

One possible strategy that the authors describe is to implement using scripts to shape the acquisition of executive skills. Dawson and Guare believe that students with executive functioning deficits should develop internalization of speech that becomes a powerful tool for self-regulation (p.65). One technique that can be employed to help self-regulation and self-management is called the Goal-Obstacle-Plan-Do-Review. In this technique, it is important for the teacher to explicitly model how to use this technique. Throughout the use of the Goal-Obstacle-Plan-Do-Review strategy, there should be a gradual-release system to the student so eventually the student is doing this independently. There are five questions that the children must ask themselves and answer

1. “What do you want to accomplish? What will it look like when you’re done?”
2. “This might be hard because....”
3. We need a plan. First we’ll do this, then this, and so on.”
4. “Do it.”
5. “Review it. How did it work out? How could we make it better?”

Dawson and Guare then go on to describe how to intervene at the level of the person or in other words, intervening “to change the child’s capacity for using his or her own executive skills” (p.58). At this stage, you want to teach the child ways to develop or fine-tune executive skills they need and motivate them to use the executive skills they may have but fall short of using. It is important for teachers to notice and praise their students in positive situations. This can be self-motivating for students to continue to employ these behaviors. However, praising

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

their actions isn't always motivating to some students. When praising is not enough for motivation, a strategy that Dawson and Guare refer to is called "Designing Incentive Systems" (p.68). This is a process that allows the student to be in control of his or her own behaviors and actions and create a student-teacher behavior contract. The steps are as follows:

1. Describe the problem behaviors and set a goal.
2. Describe the possible rewards and contingencies.
3. Write a behavior contract
4. Evaluate the process and make changes if necessary

Christopher Kaufman, Peg Dawson and Richard Guare are authors that describe some of the million possibilities of strategies that can be carried out with students who have executive function deficits. There are wide ranges of different techniques, strategies and interventions that can be employed. It is important to remember to adopt and adjust any strategy for each specific child.

## **Conclusion**

Numerous studies have been conducted that are related to students with ADHD and how their executive functions affect their literacy development. These studies have proven the relationship between students having ADHD and the link to their poor academic performance. Furthermore, research studies have proven working memory and short-term memory have the greatest impact on students overall academic achievement. Additionally, there are research studies that are being conducted to help bridge the gap between student executive function deficits. I believe that it is important to understand where your students' executive deficits are and develop strategies and techniques to help close the gap on the students' deficits.

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

Furthermore, I still support my hypothesis that working memory and sustained attention will have the biggest impact on students with ADHD and their literacy development.

### **Chapter 3: Methodology and Design**

#### **Introduction**

This study was designed to explore the impact that executive function deficits have on a child with ADHD's literacy development as well as how teachers can employ techniques to help. In this chapter, I discuss the participants, setting, methods of data collection and procedures that I utilized throughout my research.

#### **Positionality as the Researcher**

I have been substitute teaching for two years within the school district where I conducted my research. Additionally, I student taught within the school district two and a half years ago. I graduated from the College at Brockport with my Masters in Science obtaining my teaching certifications in childhood education grades one through six and special education grades one through six. Since my undergraduate graduation, I have been substitute teaching in two suburban school districts in the Rochester area. In addition, I have been working towards my master's degree at the College at Brockport for the past year in birth through twelfth literacy. Literacy plays an essential role in the success of our students' education throughout all grades. I want to be able to provide every one of my students with literacy skills to succeed in their education and their careers.

#### **Setting/Participant Selection**

I conducted this study in a suburban school district in the Rochester, New York area. The district's student population is diverse with a variety of socio-economic status and racial backgrounds. My participants consisted of three students, both male and female, in fourth grade, who have been medically diagnosed with Attention Deficit/Hyperactive Disorder before this study. All students were purposely selected based on principal recommendations and meeting the criteria of the study. From there, at random, I selected three participants with whom to work. Following the selection of the participants, I sent a letter home to the parents, to attain their permission for their child to participate. In addition, I read each participant a statement of assent to obtain the student's permission to carry out this study. To guarantee confidentiality for all parties involved, I will refer to each participant using a pseudonym.

### **Meet the Participants:**

This study consisted of unique and varied participants. Carrie, Annie and James (pseudonym) each were medically diagnosed with ADHD, before this study. However, not all participants were on medication for their ADHD symptoms during this study. Carrie was not on any medication throughout the entire study, and James was on medication throughout the whole study. When the study began, Annie was not taking any medication to help with her ADHD symptoms. However, halfway through the study she began to receive medication. Even though the participants all had a different medication scenario, I found some common themes among all three participants pertaining to their executive functions.

Carrie is a child who wants to succeed in education and puts forth her best efforts. However, she has many barriers upon which she needs to work on. Carrie has a difficult time staying focused and tuning into class instruction. She is very passive with her lack of attention.

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

It may seem as though she is paying attention but she often is tuned out of listening. Carrie also struggles with high anxiety. She was not taking any medication during the time of the research study to help with her ADHD and anxiety.

Annie is a young child who loves to attend school and to please everyone around her. She carries a positive attitude around her. Annie struggles with controlling her ADHD in the classroom environment where she tends to lose focus often and is distracted by others. Annie was placed on medication for ADHD halfway through the research. It was interesting to see the impact the medication had on Annie through this process. Although Annie has a positive attitude, she is aware of the struggles she faces in the classroom and the perception others may have about her as a learner.

James is a student who also has a positive attitude all the time. He loves to engage in conversation with adults. James has a tremendous outlook on life. He carries an encouraging and warm attitude with him. He is aware of his school struggles, but he finds his hard work makes up for those barriers.

## **Procedure**

This study was conducted over a six-week period which started in January and ended at the end of February in the 2014-2015 school year. I observed and worked with each of the participants within their regular classroom activity, once a week for approximately an hour to an hour and a half. Throughout this time, I took notes of my observations of the participant, provided the students and the student's teacher with surveys and collected student work samples. My focus was on the children's use and/or lack of use of their executive functions throughout their classroom instruction and activities.

During the first week of my data collection, I asked the participant and the participants' teacher to fill out a self-perception survey (Appendix A and B). This allowed me to grasp an understanding of how the children viewed themselves as students. In the sixth week of my data collection, I provided the participant with the same survey to see if they had changed their self-perception as learners.

Within the third week of my observations, I provided each participant with an executive function questionnaire survey (Appendix C). This survey consisted of a variety of statements that I read to each student. Each statement pertained to a specific executive function and they all were related to school behaviors. This questionnaire honed in on each individual executive function category and helped illustrate areas of weakness in the participant's executive functions.

During the six weeks, I observed the students within their regular classroom instruction and activities. There were times when I supported the students in their work and other times when I sat back without interacting with the students. I wanted to see what the participants could do with support and on their own. I note-took my observations based on all the executive functions the participant was using or lacking in the given time frame (Appendix D). This answered the question of, "what executive function deficits does the participant have?" At the end of the third week of observation, I examined and analyzed my notes to determine where the children's executive functions played key roles in their literacy development and where they lacked executive function skills. Based on each individual's executive function deficit area, I researched and provided the teacher with a technique or strategy to implement with the children in their regular classroom activity based on one of their executive function deficits. I continued to observe and note-take the last three weeks to determine if the technique or strategy had impacted the child's learning and closed the gap of the executive functioning deficit.

Additionally, I collected student work samples per teacher approval throughout the six-week period, of the child's work during his/her classroom activities. I analyzed the child's work and determined if executive functioning played a role in the child's work or not.

### **Trustworthiness**

Throughout my research design, I used a variety of qualitative research practices to ensure that my research design was valid. One practice that I used was persistent observation. Throughout my research, I evaluated and observed students with ADHD and the executive functions that were present within the observation. Another practice used in this study was member checks. During my interviews, I asked the participant to check my interpretation of their answer to review the validity of their answer. Lastly, I used dependability throughout my research. I noted any changes in the setting of my data collection and how it affected my research design.

### **Data Collection and Analysis**

There was a variety of data collection techniques used during the investigation of my research question. I gathered the students and teacher's surveys, student work samples and observation notes.

There were two surveys employed in this research. The first survey was given to both the participants and the participants' teacher (Appendix A & B). The survey was obtained from Lynn Meltzer's book called *Promoting Executive Functioning in the Classroom*. This survey examined the participants' perception of themselves as learners. Each participant was engaged in two different surveys during the research study. The first survey consisted of a self-perception survey. It asked the students how they viewed themselves as a student, how they would describe

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

themselves, how their teacher would describe them as students and how their parents would describe them as students. Each participant took the perception survey at the beginning of the research study and at the end of the research study. My goal was to see if their perception of themselves as learners changed throughout the duration of these eight weeks. Furthermore, their teacher also took the perception survey pertaining to the individual child. By providing the teacher with the survey, I could compare and contrast the view of the child to the view of the teacher. The second survey was acquired through an ADHD medical website produced by Dr. Marc Schwartz to examine executive functions in humans with ADHD and Attention Deficit Disorder (ADD). This questionnaire keys in on each specific area of executive functions (Appendix C). This questionnaire had a variety of different statements that pertained to a specific executive function. The students had to answer the statement based on a rating scale:

0-Doesn't describe me

1-Describes me somewhat

2-Describes me pretty well

3-Describes me very well

Carrie's perception of herself as a student remained the same throughout the entire study. She looks at herself as an average student who needs extra support and redirecting. As a student, she saw herself as someone who, "works hard but often gets distracted". She believes her teacher would describe her as, "hard working but needs reminders". During her end of the research survey, Carrie still saw herself as an average student who works hard but needs support. Carrie's teacher describes her as,

“A kind, emotional, passive and hardworking individual. Her strengths are in social studies and science. She has developed great peer relationships and contributes in group work. Carrie’s lack of attention is harder to refocus because it is more passive. She is often looking at instruction but not really listening. She struggles in writing task analysis, organization and conventions. She also has trouble in math analysis and fact fluency”.

In Carrie’s executive function questionnaire, her highest rating categories were distraction, organization and multi-tasking. Carrie often attends to what other classmates are doing when she should be doing her independent work. Her surroundings easily distract her from focusing on her own work. Carrie finds working to be hard if she does not have any structure or direction. She needs explicit instruction and direction with any given task. Also, she often becomes very disorganized with her desk and school papers, causing her to misplace her work. She believes she cannot carry out more than one task at a time because she then often becomes distracted and confused.

During both of Annie’s surveys, she rated herself as an average student. In the beginning of the research study, her description of herself as a student was, “I need a lot of reminder. I Do need extra help with reading and rithing. I am getting help from my psycotris”. (I need a lot of reminders. I do need extra help with reading and writing. I am getting help from my psychiatrist). Furthermore, she said her teacher would describe her as, “A good learner not allwast fokist” (A good learner not always focused). As stated earlier, Annie started to receive medication halfway through this research design. Therefore, it was interesting to see the change in her responses at the end of the research study survey. Annie still rated herself as an average student. However, she described herself now as a student who is, “a hard wrker and fokist and kind” (A hard worker and focused and kind). Additionally, she believes her teacher would

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

describe her as a student who is, “hard wrking and fokist and have meds that help with foks and a holw new kid” (hard working and focused and have meds that help with focus and a whole new kid). Annie seems to be well aware of the changes that are happening in school while she is on the medication. According to her teacher’s survey, she describes Annie as,

“A very hard worker and teacher pleaser. However, her impulsivity and lack of focus impacts all academic areas. Her strengths consist of being a kind friend, wanting to please and being thoughtful. Her areas of support include spelling, writing, organization, fluency and conventions. Also, she lacks a conceptual understanding of all math concepts. Annie lacks self-awareness, is hard working daily and loves school”.

This teacher survey was based solely on understanding Annie before she was on medication. However, I did talk to her teacher throughout the process and she stated, “I have seen a tremendous increase in Annie’s focus and learning. The medication is helping Annie focus through lessons which is helping her understand the concepts”.

After analyzing Annie’s questionnaire survey, Annie showed that she had difficulty in the areas of attention-focus, anxiety and inattentiveness. Annie is easily distracted by things she hears or sees, even when she is trying to concentrate. Additionally, she ranked highly in having trouble paying attention during instruction and she often daydreams/spaces out during the school day. Furthermore, she found she has a hard time concentrating when she has anxiety during the school day.

After analyzing James’ survey, his perception of himself grew in a positive way from the beginning of the study to the end of the study. In the beginning of the study, James saw himself as an average student. His description of himself as a student was, “Im a good and smart student

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

because I practice my math facts everyday and I listen to the teacher all the time but sometimes I need help” (I’m a good and smart student because I practice my math facts everyday and I listen to the teacher all the time but sometimes I need help). Additionally, he believed his teacher would describe him as, “I think my teacher thinks im average because I always get my work done but need help sometimes”. On the end survey, James attitude was much more positive. He now saw himself as an above average student and his statement about himself as a student was much more powerful. “I feel like im a awesome student for my class showing good skills”. His perception of what his teacher would say also changed to being a positive statement, “I think he would describe me as a student that works hard”. In the end survey, James perception strengthened, he did not see himself as a student who needed extra help. According to James’ teacher,

“James is a caring, honest, cooperative student who is liked by his peers. He benefits greatly from structure and has a positive attitude towards school. He wants to be successful and works extremely hard to improve himself. James needs frequent check-ins during independent work time. James struggles in beginning a new task, often writing, and lacks self-confidence”.

After the analysis of James’s executive function questionnaire survey, his highest ranked categories were perseverance and focus, memory, organization and distraction. James expressed he had a hard time sticking to optional assignments and often switched from doing one thing to another. He had a hard time committing to one task until it is completed. He stated he has trouble recalling from his short-term memory. He frequently forgot previously taught facts. In addition, James had a hard time staying organized. He usually has a pile of papers cluttered on top of his desk. His desk was habitually messy which caused him to lose papers.

Another method of data collection was student work samples. By collecting these student work samples from classroom activities, I was able to analyze if the participant was using executive functions throughout their work. I analyzed the participants planning, organization, time management, working memory and metacognition within the given sample.

The final method of data collection was my note taking and observations (Appendix D). My observations of the participant throughout the six-week period allowed me to see essential key components the child used or did not use throughout his/her classroom instruction and activities. I noted distractions and actions that were being taken within the given observation of the child and his/her surroundings. This allowed me to key in and observe each individual executive function and how it was being or not being incorporated into the participants' schoolwork. The analysis of his/her environment and actions that were being taken helped determine techniques and strategies that may help bridge that gap in any executive function deficit areas.

As I analyzed my observations of Carrie, two themes emerged; lack of attention and working pace/anxiety. Throughout my observation, there were multiple reoccurrences of Carrie fidgeting with items around her. There were times when she would tap her fingers or be playing with her hands or things in her desk. Her most common fidgeting action was playing with her hair. In addition, Carrie seemed to find ways to move around the classroom, even if she didn't need too. She often would get up to get a drink during her working time or go to the bathroom. During a 30-minute work period, Carrie got up five different times; got a drink, needed to use the bathroom, had to sharpen a pencil, got a drink, needed something out of her backpack. When Carrie was in her seat or work area, she often would stop to see what everyone else in class was doing. For example, when the teacher would start to talk to someone, Carrie would stop doing

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

her work and focus on what the teacher was saying to the student. Carrie was very distracted by her surroundings and the peers in her classroom. This distraction caused her to become disengaged from her work.

Another common theme that emerged from observing Carrie was the pace at which she worked. During most of my observations, Carrie was behind in her work or did not finish her work in the allotted time that caused Carrie to fall behind in many of her assignments. As I observed Carrie, I noticed Carrie takes her time to write her answers or thoughts to the given questions. As she is writing, if she messes up or it does not look neat, she takes the time to erase it completely and fixes it to appear as perfect. Her writing is very precise and organized but it also takes time away from her moving forward with her work. Anxiety does play a role in her school assignments. When I asked her about her writing during one observation she simply stated to me, “my writing needs to be neat and cannot look messy. So I take my time while I am writing”. Furthermore, the pace at which Carrie works repeatedly causes her to lose her train of thought. Carrie often tried to recall the information she was going to write next but frequently could not remember.

After the analysis of my observations, two reoccurring trends with Annie were attention difficulty and working pace/ reinforcement. As I began my observations with Annie, I noticed she was very involved in getting right to work and was able to transition to new tasks without any problems. Annie seemed to want to really do a great job in her schoolwork. However, I did notice she often needed reassurance throughout her task from an adult and her teacher needed to redirect her multiple times throughout the tasks. During my observations, I noticed multiple times through one assignment where Annie would get up to check with the teacher even if she was not done with the assignment. During another observation, Annie seemed to rush through

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

her work in order to get her work done. Her teacher did reinforce with her during multiple observations, “You are going too fast and missing important information. I want you to slow down so you can comprehend what you are reading”. This happened all the way through the eight weeks.

Furthermore, Annie had trouble recalling strategies to use during her working period. During one observation, Annie got up out of her seat to grab a highlighter for a reading passage. Although Annie grabbed the highlighter, she did not use it during her reading. Later on during a guided-reading session, Annie’s teacher revisited all the strategies Annie could use during reading. Although Annie had already been taught all these strategies, she needed to be re-taught them and redirected to use them. This raised a concern of Annie’s executive function with working-memory. Annie was either rocking her chair, swaying her feet or finding a way to get out of her seat. During one particular observation, Annie had a very difficult time staying focused. The class was sitting at the carpet with clipboards and a practice ELA state exam. As a class, the teacher was going over the questions and the correct response. Annie needed six redirecting prompts during the 45-minute lesson. She was playing with the clipboard and her pencil. Additionally, she was having a difficult time following the teacher’s directions. As Annie started to take medication, the redirecting and refocusing prompts decreased but were still present. After the analysis of my observations, Annie had a difficult time with sustained attention.

In examining James’ observations, I found a common theme of recalling information and sustained attention difficulty. As I observed James throughout the first couple of weeks, James struggled to stay engaged in his work and often did not participate in group discussions. During one of my observations, the class was participating in a Socratic seminar around the issue of

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

*Should all field trips be educational?* Together as a whole class, the students built off each other's ideas and invited other students to speak their opinion. James instead was working on a worksheet at his seat. He did not ever try to jump in the conversation and did not acknowledge who was talking in the group. His teacher did redirect him but James did not want to engage in the conversation. Later in a conversation with James, we discussed why he did not participate in the Socratic seminar. He expressed his concern of not remembering the article the Socratic seminar revolved around. In another observation, James was working with a small group of students and his teacher. His teacher posed the question to James of, "What strategies should we use when we are close reading?" James could not recall these strategies and struggled in communicating his unawareness to his teacher.

Throughout my observations, James needed numerous redirecting prompts from this teacher. Often times James would be staring out the window or he would be fidgeting with an item at his desk or in his desk. James had a tendency to fall into space at times. The teacher would redirect him and bring him back to his assignment but he would then eventually fall back into space. During one observation, the teacher was giving explicit instructions on a new lesson. James was moving all around. He was pushing his chair in and then pushing his chair back out. He would put his head down on the table and then lift it back up. Also, his hands were in all different positions throughout the lesson; closed together, over his ears, in his desk, playing with his pencil and used as a head rest. James had a very difficult time adhering to instruction and being able to sit still for extended periods of time.

During the last few weeks of the research study, I implemented a strategy into place for each of the three participants. The strategy was consistent among all three participants. Each participant had access to a stress ball throughout his or her entire school day. This stress

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

ball stayed in their desk. The students were instructed to use their stress ball when they started to notice they were losing focus, becoming stressed or had anxiety throughout the day. If they were to use the stress ball, they would take three squeezes in their right hand and then three squeezes in their left hand. They were then to put the stress ball away. Furthermore, each student received a bubble seat to use throughout his or her entire day. The students did not need to use the bubble seat when they felt they did not need it. However, they were to use it in times of explicit instruction from their teacher and during independent seatwork.

The implementations of the stress ball and bubble seat were not as effective as I would have hoped for Carrie. During my observation of the strategies implemented into Carrie's daily learning, she rarely used the stress ball and did not use the bubble seat unless she was asked too. The stress ball was the strategy that I believed would have benefited Carrie the most due to her anxiety. During one observation, I did notice Carrie used her stress ball, but she used it under her desk where no one could see. Carrie did not like the bubble seat at all. She found the bubble seat uncomfortable. In a discussion with Carrie, she stated she does not like to be different from the rest of her peers. She felt like the bubble seat was isolating her from the others in her class and her peers were watching her.

Annie seemed to take to the strategies. As I observed Annie using the stress ball and bubble seat, it did take some time for her to get used to them. She struggled with finding a comfortable position for the bubble seat. With the stress ball, she often found herself wanting to play with the ball. As I conversed with Annie about the use of the stress ball and bubble seat, she stated, "I like the stress ball because it helps me but I don't like the bubble seat because it is not comfortable". During one observation, Annie used the stress ball during an independent writing task. She was in the middle of writing when she started looking around the room and seemed

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

almost stuck on what to write next. She took the stress ball out and used it in the correct manner. She then attended back to her writing. The bubble seat seemed to be more of a distraction for Annie than a helpful strategy.

The stress ball and bubble seat became positive strategies for James. During my observations, James was attending to the stress ball strategy when he was asked to participate or share an idea with his classmates. The stress ball gave James a source of relief of stress and anxiety when he was asked to participate. The bubble seat also seemed to work for James. James often was swaying back and forth on the bubble seat in a contained manner that allowed him to attend more to his work with less day dreaming. James also believes both of these strategies have helped him. He stated, “I like using the bubble seat because it helps me stay focused and the stress ball because I do my three squeezes and then I am ready to continue working. It gives me a break from my thinking”.

Through my analysis of my data collection, I found that all three participants demonstrated commonalities in their academic performance and executive functions. As each individual experienced a different process of medication to help treat their ADHD symptoms, all three participants demonstrated executive function deficits in the areas of sustained attention and working-memory.

## **Chapter 4-The Findings**

### **Introduction**

Through my data analysis, I learned that students with ADHD have many obstacles to overcome within their educational settings. Students with ADHD are at an increased risk of inattentiveness, which has a significant impact on their academic success. Throughout this study,

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

I observed three participants who struggled in the executive function areas of sustained attention and working-memory. I observed the impact these executive function deficits had on each participant's academic growth. Furthermore, students with executive function deficits can employ strategies into the academics learning to help reduce the significance of this gap.

### **A Positive Self-Perception and Awareness of Their Academic Struggles:**

One theme I observed across all students was their perception of themselves as a student. They all ranked themselves as average learners with some difficulty in school. My goal was to determine if their perception of themselves as learners changed during the duration of these eight weeks after implementing a strategy into place to help in their executive function deficit areas. Furthermore, I wanted to determine if the student's self-perception correlated with any possible executive function deficits. In executing these surveys, it signified the knowledge and self-awareness each student had of their strengths and difficulties within the academic setting. Furthermore, the surveys indicated self-awareness and perception of the students were not affecting their academic growth. All three participants demonstrated a positive attitude and perception of themselves as learners.

Throughout the surveys, each student acknowledged their sustained attention coming into play within their school day. Carrie said she is someone who, "works hard but often gets distracted". Additionally, Annie told me she is, "A good learner who is not allwast fokist". (A good learner who is not always focused). James described himself as a student who listens to his teacher all the time but sometimes needs help. The help could range from redirecting James to working one-on-one with him. It is important students to have a positive self-perception of themselves as learners, as this can be key to helping them succeed in their academics. The

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

analysis of the participants' surveys reinforced the students' positive self-perception of themselves but also their awareness of their difficulties.

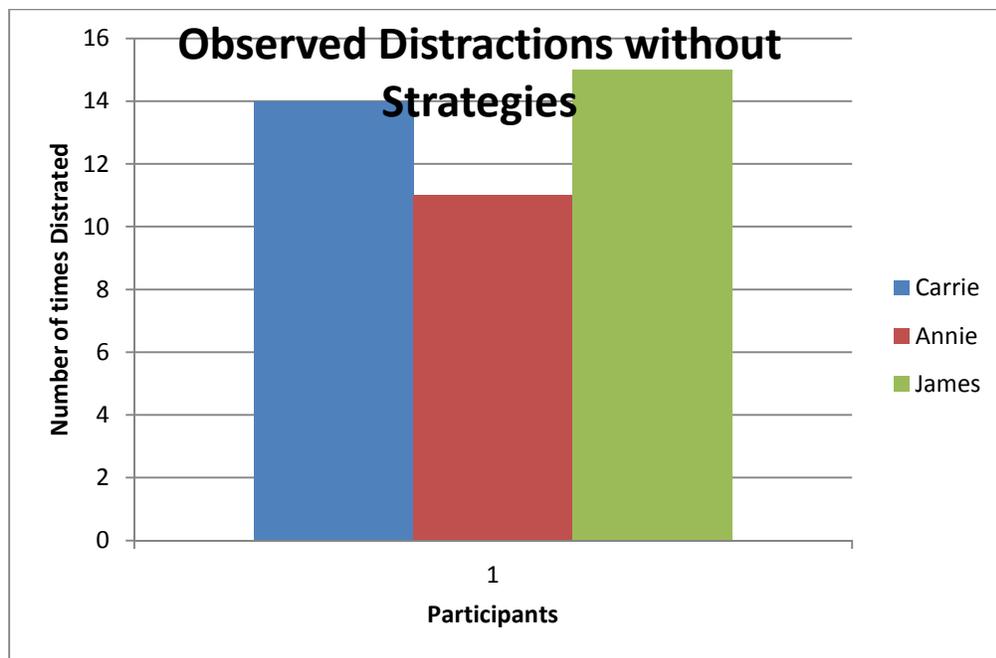
Through my analysis of the executive function questionnaire, I was able to gain a better sense of the areas to which the students most related. After analyzing each individual questionnaire, I was able to see specific areas of executive functions that affected each participant. There were some commonalities and some differences. Carrie had three categories that stuck out to me in my analysis. Carrie's highest rating categories were distraction, organization and multi-tasking. Annie's highest rating categories consisted of attention-focus, anxiety and inattentiveness. James had four categories that caught my attention; perseverance and focus, memory, organization and distraction. This executive function questionnaire was able to isolate the executive function of sustained attention in all three participants. Carrie, Annie and James all had trouble with focus, distractions, or inattentiveness.

Each participant had a positive self-perception of himself or herself. They were able to acknowledge themselves as hard workers who put their best efforts forward. Furthermore, each participant had a great self-awareness of where he/she tended to struggle within the academic environment. Melanie Reader (2011) believes, "self-awareness is the first step in becoming a self-advocate and is positively related to life success. Students must know and understand themselves before they can tell others what they want or need" (p. 6). This is an important and essential first step in helping students with ADHD overcome their executive functioning deficits. I was able to identify an area of focus among all three participants with my executive function questionnaire. Each participant identified sustained attention to be deficit a within his/her executive functions.

### **Sustained-Attention and Working-Memory**

Through my first weeks, I observed the participants using the same observation worksheet for all three participants. I observed my students during a wide-range of literacy tasks. During some of my observations, I would interact with the participants and I assessed their work samples as they completed each task. Other times I would not interact with them as they engaged in the work period, assessing their work samples at the end. My focus was on the student, the executive functions that were apparent, and the effect of the executive function on the student.

Each of the three participants showed difficulty in the areas of sustained attention and working-memory in their own unique way. Schweizer and Moosbrugger (2004) conducted a study to examine the relationship between sustained attention and working-memory. They found, “The concepts of attention and working suggest relatedness. The attention functions that are ascribed to the central executive of working memory even signify a very close relationship instead of independence (p. 332). Below is a graph that represents the number of times each participant was inattentive to classroom instruction during the first three weeks of this study. During this time, the students did not have any strategies in place to help in the areas of sustained attention and working-memory. The graph represents a considerable number of times that each participant became distracted or lost their focus within the first three weeks.



Carrie, Annie and James each had a significant amount of distractions within the first three weeks of observations. These distractions took their attention and focus way from classroom instruction that caused them to either become lost, behind or confused. Every time the students lost their focus, they would miss important aspects of their literacy instruction which plays a significant role in their development.

Furthermore, working-memory affected each of the participants within their literacy development. Throughout my observations, each participant at one time or another, needed extra prompting on recalling previously taught information. During one of my observations, James was having trouble remembering the close reading strategies that he learned earlier in the year. This caused James to become frustrated and inattentive to the work at hand. The recall of previously taught information was-observed within Carrie and Annie's instructional classroom. The analyses of these findings prove the impact working-memory has on students with ADHD. Working-memory plays a crucial role in literacy development. Students with a working-memory

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

deficit have difficulty with information processing which can cause students to struggle in recalling previous learned information. Davis, Sheldon and Colmar (2014) believe, “With teachers providing greater focus on, or attempting to draw links with familiar knowledge stores, some working memory limits may be migrated (p.113).

### **A Positive Outcome of Strategy Implementation**

In implementing strategies into the students’ area of executive function deficit, I was looking to see if the strategies played a positive role in the students’ literacy development. As all three participants displayed executive functioning deficits in the area of sustained-attention, I implemented the strategies of a stress ball and bubble seat into all three participants’ academic settings. My goal was to develop a strategy to help decrease the students’ inattentiveness, distraction and loss of focus. By decreasing the amount of times a student becomes distracted, there is an increase in instructional delivery for the student. Below is a graph on the number of times each participant became distracted during the three weeks of the implementation of the stress ball and bubble seat.



As I analyzed the impact of implementing these two strategies into their classroom environment, I discovered the strategies had a positive influence on the participants. During the three-week period of observing the students, there was a significant decrease in the amount of times each participant became distracted or lost their focus. Carrie, Annie and James's number of distractions decreased by over 50% once the strategies were implemented. "Teachers can help students with ADHD overcome their deficits with planning and strategy use by providing direct instruction in planning and using strategies" (Johnson & Reid, 2011, p.63).

The analysis of the implemented strategies in this study indicated a positive effect on students and their sustained attention. Through an analysis of each of the strategies, two of the three students expressed their dislike of the bubble seat. Even though some of the participants were not adapting well to the bubble seat as a strategy, the data shows the bubble seat had a positive effect on the students' sustained attention. On the other hand, the use of the stress ball

showed positive action among the participants. All three participants used the stress ball, in their own way, to help them regain focus and decrease anxiety levels.

## **Chapter 5- Conclusions and Recommendations**

### **Summary of the Major Results**

After generally studying executive functions in students with ADHD and how it affects their literacy development, an overall consensus supports that students with ADHD tend to struggle in literacy development revolving around executive function development. Through the analyses of findings from my surveys and observational notes, my original hypothesis of working memory and sustained attention being two major executive functions that impact a student's education was supported. Daryl Fougine (2008) believes, "The capacity to perform some complex tasks depends critically on the ability to retain task-relevant information in an accessible state over time (working memory) and to selectively process information in the environment (attention)" (p.1). It was discovered that each participant struggled with the executive functions of sustained attention and working-memory.

The analysis of this study revealed that students with ADHD struggle in the executive function areas of sustained-attention and working-memory. The implemented strategies were both positive. Working with students who have executive function deficits is an on-going process in which teachers need to adjust and adapt to meet the needs of their students. Although, one strategy was proven ineffective, teachers have the ability to implement and try other strategies that may be effective for the students.

## **Results Relating to the Literature**

Previous research pertaining to students with ADHD, executive function deficits and academic success support my findings. Current research has discovered executive function deficits in students with ADHD links to academic performance. Researchers Major and Martinussen (2011) conducted a study that looked at students with ADHD and how it affected their academic performance. Major and Martinussen (2011) found, “evidence suggests that students with ADHD with EF deficits display lower levels of academic functioning than their peers without ADHD, and students with ADHD without EF deficits” (p.69). Additionally, research studies by Biederman, Monuteaux, etc. and Fuhs, Nesbitt, Farran and Dong support the findings of the link between poor academic performance and students with ADHD.

Additionally, many research studies have discovered the relationship of sustained attention and working-memory impacting students with ADHD and their academic performance. This research study supports Garcia-Madruga, Vila, Gomez-Veiga, Duque and Elosua’s (2014) findings. These researchers discovered the impact working-memory has on students and their academic performance. Working-memory plays a significant role in student progress. My results support the findings of Arrington, Kulesz, Francis and Fletchers (2014) study that examined the contribution of attention control and working memory to reading comprehension and decoding. These researchers found, “significant direct effects of working memory, sustained attention, and cognitive inhibition on reading comprehension, as well as significant direct effects of working memory and response inhibition on decoding” (p.339).

Furthermore, research supports the idea of implementing a strategy in place to help students with ADHD in the area of their executive function deficits. It has been found that

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

implementing a strategy with a student with ADHD in the area of the student's executive function deficit can help improve academic performance. Harlacher, Roberts and Merrell (2006) conducted a study that examined implementing a class wide intervention instead of a individualized program. They found. "Such class wide interventions are more cost-effective and efficient than individualized interventions because a teacher may use the intervention to help one student perform better in the classroom, but its use may benefit the performance of all students in the class" (p.7). Additional research from Kaufman and Dawson and Guare support strategy implementation for students with executive function deficits.

### **Implications for Practice**

ADHD affects millions of children and adults every day. As teachers, we will encounter multiple students within our classrooms that are diagnosed with ADHD. It is essential for us as educators, to understand the skills that may be affected by their ADHD and to find strategies for them to overcome this struggle. There are numerous ways to help our students with ADHD to overcome executive function deficits that may be affecting their academic growth. "Teachers can help all students perform better if the adults understand the developmental nature of executive function and the way the classroom and other school environments can be constructed to enhance executive skill sets" (Kaufman, 2010, p.15). It is important and essential to understand that implemented strategies may not always work for the particular student. However, in taking the necessary steps to understanding the student and adjusting and adapting strategies to meet the need of the student, we can help improve the student's academic success.

One recommendation for teachers is to understand the area(s) in the child that may be affected by their ADHD and executive functions before implementing a strategy. There is a

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

range of executive functions that can be affecting a student's academic performance. Observing and evaluating the student is a key aspect in determining what strategy to employ or if there are any executive function deficits present in the child. "Executive function deficits do not characterize all individuals with ADHD, but they appear to be crucial for performing a range of important activities. In particular, executive functions have been linked to academic performance" (Miller, Nevado-Montenegro, Hinshaw, 2011, p.658). It is essential to understand any executive function deficits that may be effecting the student's achievement and growth.

Another recommendation is for teachers to research and implement strategies into the students' educational setting to help bridge their deficit gap. Capellini and De Oliveira (2013) find learning strategies to be, "Techniques that students use to acquire, store and to use the information, in which different resources are required to learn a new content, or to develop some skills, which can be generalized for learning others tasks and contents, or restricted to a specific task" (p. 54). Finding a successful strategy for a student can help students academically succeed. Furthermore, teachers need to explicitly teach students the correct way to execute the strategy before actually having the student carry out the strategy. Johnson and Reid (2011) suggest, "Effective strategy instruction for students with ADHD should directly and explicitly teach the steps in the strategy, provide students with information on the value of the strategy, and continue until the student has mastered the strategy and can use it independently (p.63).

### **Limitations:**

This study contains of some limitations. This study took place during a short period of time that limited the data collection sample and the analysis of growth over an extended period. Due to the time constraint, the data collection of three weeks was limited and less reliable than a

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

study conducted over a full year. The time-period of the study also restrained the impact a technique or strategy may have on participants and their growth in executive function if the strategy was not continued after the study. The strategy implementation of three weeks was not enough time to show the overall impact of the applied strategy. Another limitation of the study is the sample size of three participants who all attended the same suburban school district. This study does not include a wide variety of participant background.

### **Future Research Needs**

Understanding the impact executive function deficits have on our students with ADHD is essential to helping them succeed in their academics. Future research should examine students with ADHD and the impact early intervention can have on their overall academic performance. Examining the impact of intervening with students at an earlier age may signify growth in academic success.

Furthermore, future research should focus on implementing a variety of strategies pertaining to a specific executive function and its overall impact on student progress. As stated earlier, not all strategies will work for an individual student. Implementing a strategy into a child's academic education is a trial and error process. Research needs more studies that investigate a range of strategies to help students with executive function deficits to increase academic growth.

### **Overall Significance of the Study**

The purpose of this study was to examine and explore students who have been diagnosed with ADHD and how executive function affects their literacy development. Furthermore, I hoped to inform teachers how they can employ strategies and techniques to help bridge this gap. As

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

educators, it is essential to understand and recognizing not only the strengths of our students but also the areas where they need support. Students' development of executive functions plays an important role in how students learn. Peg Dawson and Richard Guare (2010) believe, "determining the level of a child's executive skill in relation to their developmental task can help us to understand the 'goodness of fit' between the child and his or her world" (p.9).

### References

- Arrington, N., Kulesz, P.A., Francis, D.J. & Fletcher, J.M. (2014). The contribution of attentional control and working memory to reading comprehension and decoding. *Scientific Studies of Reading*, 18: 325-346. DOI:10.1080/10888438.2014.902461
- Biederman, J., Doyle, A.E., Faraone, S.V., Ferrero, F., Monuteaux, M.C., Morgan, C.L., Seidman, L.J., & Wilens, T.E. (2004). Impact of executive function deficits and attention-deficits/ hyperactivity disorder (ADHD) on academic outcomes in children. *Journal of Consulting and Clinical Psychology*, 72 (5), 757-766. DOI: 10.1037/0022-006
- Bull, R., Espy, K.A. & Wiebe, S.A. (2008). Short-term memory, working memory and executive functioning in preschoolers: longitudinal predictors of mathematical achievement at age 7 years. *Taylor & Francis Group, LLC*, 33 (3), 205-228. DOI: 10.1080/87565640801982312
- Capellini, S.A. & De Oliveira, A. M. (2013). Learning strategies evaluation in students with Attention deficit hyperactivity disorder. *Education Sciences & Societ*, 4(2): 53-64
- Clark, V.L. & Creswel, J.W. (2010). *Understanding research: A consumer's guide*. Saddle River, NY: Pearson Education, Inc.
- Davis, N., Sheldon, L., Colmar, S. (2014). Memory mates: A classroom-based intervention to Improve attention and working memory. *Australian Journal of Guidance and*

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

*Counseling*, 24:1,111-120

Dawson, P. & Guare, R. (2010). *Executive skills in children and adolescents* (2<sup>nd</sup> ed. )

New York, NY: The Guildford Press.

Fougnie, D. (2008). The relationship between attention and working memory. *Nova Science*

*Publishers, Inc.*, 1-45.

Fuhs, M.W., Nesbitt, K.T. & Farran, D.C. (2014). Longitudinal associations between

executive functioning and academic skills across content areas. *American*

*Psychological Association*, 50 (6), 1698-1709. DOI: 10.1037

Garcia-Mandruga, J.A., Vila, J.O., Gomez-Veiga, I., Duque, G. & Elosua, M.R. (2014)

Executive Processes, reading comprehension and academic achievement in 3th

grade primary students. *Learning and Individual Differences*, 35, 41-48

Johnson, J. & Reid, R. (2011). Overcoming executive function deficits with students with

ADHD. *Theory Into Practice*, 50:61-67

Kaufman, C. (2010). *Executive function in the classroom*. Baltimore, MD: Paul H. Brookes

Publishing Co.

Krajewski, K. & Schneider, W. (2009). Exploring the impact of phonological awareness,

Visual-spatial working memory, and preschool quantity-number competencies

on mathematics achievement in elementary school: Finding from a 3-year

longitudinal study. *Journal of Experimental Child Psychology*, 103,4, 516-531.

DOI: 10.1016/j.jecp.2009.03.009

Running Head: THE EFFECTS OF EXECUTIVE FUNCTIONS IN CHILDREN WITH ADHD

Major, A. & Martinussen, R. (2011). Working memory weaknesses in students with ADHD: implications for instruction. *Theory into Practice*, 50, 68-75. DOI:

10.1080/00405841.2011.534943.

Miller, M., Nevado-Montenegro, A., & Hinshaw, S.P. (2012). Childhood executive functions continues to predict outcomes in young adult females with and without childhood-Diagnosed ADHD. *J Abnorm Child Psychol*, 40:657-668.

Pennington, B.F. & Ozonoff, S. (1996). Executive Functions and developmental psychopathology. *Journal of Child Psychology and Psychiatry*, 37,51-81.

Reader, M. (2011). Setting students up for success through self-awareness and self-advocacy.

*Perspectives*, 6-8.

Schweizer, K. & Moosbrugger, H. (2004) Attention and working memory as predictors of intelligence. *Elsvier*, 32(4): 329-347.

Short-term Memory (n.d.) Retrieved November 26, 2014 from

[http://en.wikipedia.org/wiki/Short-term\\_memory](http://en.wikipedia.org/wiki/Short-term_memory)

Tools of the Mind (2014). Philosophy. *The vygotskian approach*. Retrieved from

<http://www.toolsofthemind.org/philosophy/vygotskian-approach/>

**Appendix A**

Self-Perception of student

As a student, I think am\_\_\_\_\_

Poor      Below average      Average      Above Average      Strong

How do you describe yourself as a student?

---

---

---

---

How do you think your teacher would describe you as a student?

---

---

---

---

How do you think your parents would describe you as a student?

---

---

---

---

**Appendix B**

Self-Perception from teacher of student:

Overall academic performance:                    1            2            3            4

What words come to mind to describe this student (e.g. motivated, hard working, invested)?

---

---

---

---

What are some strengths of the child as a student?

---

---

---

---

What are some areas that need extra support for the child as a student?

---

---

---

---

## Appendix C

### Executive Function Questionnaire

#### Scoring Key

Answer how well each statement describes you when you don't use special aids or tricks you have developed to get around or compensate for difficulties you might have. Score each answer as follows:

- 0** - doesn't describe me at all
- 1** - describes me somewhat
- 2** - describes me pretty well
- 3** - describes me very well

	Score
<b>INITIATION</b>	
I have trouble getting started doing things	
I procrastinate	
<b>COMPLETION</b>	
I have trouble completing things	
<b>EXECUTION</b>	
I don't do tasks efficiently (good job in short time)	
It is hard for me to do two or three tasks in a row.	
I don't always do what needs to be done.	
<b>DISTRACTION</b>	
I am easily distracted by things I hear or see even when I am trying to concentrate	
<b>PERSEVERANCE AND FOCUS</b>	
I don't stick to tasks that are optional	
I can't stick to a task even if I have to	
I often switch from doing one thing to another	
<b>INATTENTIVENESS</b>	
I don't pay attention when I should	
I day dream/space out	
I have trouble listening while others speak to me	
I am absent minded	
	<b>Score</b>
<b>MEMORY</b>	

I have trouble remembering things I want to do	
I get so deeply into one thing that I forget others	
I have trouble with my short term memory	
I lose or misplace things	
<b>TIME</b>	
I confuse appointment times	
I forget appointments	
I am often late for appointments	
<b>FUTURE AWARENESS AND PLANNING</b>	
I have trouble making plans long in advance	
I let my gas tank needle get close to empty	
I rarely get to trains at least 10 minutes early	
<b>ORGANIZATION</b>	
I get disorganized	
My personal work area is messy	
I put on my seat belt after the car has started moving	
I don't prioritize or plan my day	
I can't work well without structure or direction	
I have difficulty taking command of my time.	
I waste a lot of time doing nothing.	
<b>PHYSICAL ACTIVITY (HYPERACTIVITY)</b>	
I need to keep walking, moving around	
I have trouble sitting still, I fidget	
<b>FRUSTRATION/IMPULSIVENESS</b>	
I get angry easily	
I am easily frustrated	
I get impatient easily	
I interrupt when other people are talking	
I am impulsive, do things without thinking	
I don't express or communicate my anger constructively	
<b>ANXIETY</b>	
I focus and concentrate better if I am somewhat anxious.	

<b>MULTI-TASKING (parallel)</b>	
I have trouble doing more than one thing at a time well	
I often try to do more than one task at a time	
I tend to make things more complicated than they need to be	

	<b>Score</b>
<b>MULTI-TASKING (serial)</b>	
I dislike tasks that require a long series of steps	
<b>SLEEP</b>	
I have trouble getting to sleep because my mind is going	
<b>UNCATEGORIZED</b>	
I get so deeply into one thing that I forget other things I have to do	
I believe that there is usually a quick solutions to problems	
I do not like to commit because I don't know how I will feel in the long term	

Impressions/Comments:

---



---



---



---



---



---



---



---



---



---



---

**Appendix D***Observation Chart**Student Name and Date:* \_\_\_\_\_

<b>Setting/ Learning Targets</b>	<b>Running Notes</b>	<b>Reflection/ Affects</b>