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Building Executive Function and Self-Regulation in Preschool

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Capstone Project: An Action Research Project

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Abstract

This action research was inspired by the researcher's interest in building executive function skills in preschool aged children and the effects this would have on incidents of dysregulated behaviors in the classroom. After completing a baseline measurement of the participant's current level of executive function skills, the researcher implemented interventions designed to strengthen these skills. Interventions included providing teacher support in creating play plans during dramatic play, providing a choice board of game options during recesses, teaching mindfulness yoga relaxation techniques, and embedding practices include scaffolding, activating prior knowledge, providing think time, adding pair-share during large group discussions, preteaching vocabulary, and modeling metacognition during problem solving. The researcher also recorded the number of incidents of dysregulated behavior each day. The researcher is entering her third year as an early childhood special education teacher in the public school system. The findings reveal both an increase in executive function skills and a decrease in incidents of dysregulated behavior. This research was conducted to impact the researcher's future classroom best practices.

Keywords: executive function, self-regulation, kindergarten readiness, preschool

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Building Executive Function and Self-Regulation in Preschool

According to the National Education Center for Educational Statistics, in 2019, 88% of five year old children, 69% of four year old children, and 40% of three year old children, attended preschool in the United States. Kemple, Lee & Ellis (2019) further report that when persistent patterns of challenging behaviors are evident in preschool aged children, approximately 50% of these same children have difficulties adjusting to kindergarten, and by the age of nine, 69% will meet the clinical criteria for externalizing behavior problems. In addition, Montroy, et al. (2016) conclude that half of the kindergarten teachers who participated in their study report children are entering the kindergarten classroom without the necessary skills; being able to focus their attention, independently complete their work, sit for longer periods of time, easily transition from one activity to another, and follow multistep instructions, all essential components of kindergarten readiness (Bassok, Latham, & Rormem, 2016).

Executive function is at the heart of self-regulation, essential to academic learning (Gooch, et al., 2015) and plays a key role in children showing readiness for kindergarten (Nesbit, Farren, & Fuhs, 2015). Executive function does not consist of just one skill, but instead a group of skills that help an individual to focus on more than one task at the same time, watch for mistakes, use all available information to make a decision, change their plans when they need to, and control their impulse to make quick decisions based on their level of frustration (Moreno, Schwayder, & Friedman, 2017). In turn, Blair and Raver (2015) describe self-regulation as the ability the child has to control their emotions, attention, and behaviors which supports positive social interactions and academic success. Self-regulation is a result of all the components of executive function working together to determine how the child will react to any given scenario (Lonigan, et al., 2017).

An In-Press report published by Weintraub, et al. (2013), indicated the development of executive function begins as soon as a child is born, and has the potential for rapid growth from the ages of three to five, and then continues steadily through adolescence. It is important to remember that children are not born with the natural ability to maintain their focus, create a plan, or even to control their impulses. However, as Weintraub, et al. (2013) asserts, each child is born with the potential to strengthen these capacities depending on the quality of their early life experiences. Simply put, the brain learns to adapt itself to the experiences it is exposed to.

Therefore, the importance of developing these essential executive function skills in the preschool classroom cannot be overstated. There will be a natural difference in the pace of each child's skill development, yet each child has the potential for strengthening these skills through the quality of interactions and experiences provided them. No matter what their current level of development in executive function, there are activities and strategies that can be easily incorporated into the daily routines which can promote the growth of cognitive flexibility, inhibition control, and working memory in every child (Blasco, Saxton, & Gerrie, 2014).

The purpose of this action research study is to offer meaningful and intentional play based learning activities that will promote the growth of executive function skills and decrease the incidents of behavior dysregulation in preschool classrooms. The intent of this project is to determine the most effective research based methods and strategies for cultivating these essential skills in young children and ensure they are best prepared to enter kindergarten.

The resources utilized for this action research project were compiled from the DeWitt Library at Northwestern University. Studies relating to kindergarten readiness, executive function, self-regulation, and interventions being successfully implemented were reviewed. The

criteria for inclusion included that the studies were published in peer-reviewed journals within the last ten years.

Review of the Literature

It has become more common that children are entering the preschool classroom exhibiting extremely challenging behaviors. These behaviors are often blamed on willful defiance and belligerence. However, the studies reviewed in this action research project build a strong case that these challenging behaviors are instead caused by deficits in the development of the executive function skills. All studies presented demonstrate the positive impact that early intervention can have on these deficits.

Kindergarten Readiness

There have been many changes in the kindergarten classroom over the past two decades (Bassok, et al., 2016). What was once considered a transitional year where the emphasis was placed on all areas of child development has transformed into the first year of formal education (Bassok, et al., 2016). Cavanaugh, et al. (2016), affirms that what was once a place of exploration and free play has now become a place filled with academic rigor, learning standards, and assessments. For this reason, it is understandable there has also been an increased interest in how best to prepare a child to be ready to face the challenges presented in the kindergarten classroom.

In the study conducted by Bassok, et al. (2016), a 1998 sampling of 21,000 children and another 2011 sampling of 18,000 children enrolled in public school kindergarten, were compared to determine changes in the description of school readiness, assessment practices, and how much time and focus was devoted to each component of the curriculum. According to the findings, there remains a strong focus on self-regulation and social skills and an increased emphasis on

academic skills such as knowing the letters of the alphabet and being able to count to 20 (Bassok, et al., 2016). In a similar study, Blair & Raver (2015) concluded that the pressures administrators and educators have felt as a result of the *No Child Left Behind* legislation have transformed the kindergarten classroom into a place where much of the day is spent on math and literacy instruction and less time being devoted to social skills and exploration. Even though few of the teachers interviewed supported a strictly academic interpretation of school readiness (Blair & Raver, 2015) this shift to a more academic focus in kindergarten changes the way schools define each child's readiness to enter the classroom.

Therefore, when the term school readiness is used, it comprises both academic and social areas of child development. Fitzpatrick (2012) describes school readiness as a child having the skills and maturity required to meet the demands of a formal classroom setting. A 2015 study conducted by Nesbitt, et al., where 1,054 preschool aged children in 80 classrooms were followed over the course of a year. They were assessed at both the beginning and end of the year and observed at three intervals during this same year. The researchers were specifically observing for growth in learning related behaviors such as the level of participation and engagement in academic related activities, the ability to interact with peers in social learning activities, and the child's ability to refrain from disruptive behaviors (Nesbitt, et al., 2015). The results indicated that in order for learning to occur the child must be able to regulate all areas of their behavior including sustaining attention, refraining from disruptive behavior, and working collaboratively with their peers during learning activities (Nesbitt, et al., 2015). In other words, the child's social skills can either negatively or positively impact their performance in academic related skills such as math and literacy. In a similar study researchers Moffett & Morrison (2019) concluded there are much higher expectations placed on children entering kindergarten to focus

their attention while sitting for longer periods of time, follow complex two or more stepped instructions, to complete their work independently, and quickly and seamlessly transition from one activity to the next. Moffett & Morrison (2019) describe the integration of these skills as behavioral self-regulation, or the expression of executive function within behavior, and emphasizes the role it plays in the child's later academic achievement.

Montrey, et al. (2016) further validate the impact self-regulation plays in academic outcomes and expound that a child demonstrating lower levels of self-regulation will have difficulties acclimating and engaging in a formal classroom setting. In fact, nearly half of the kindergarten teachers surveyed in the 2016 study by Montrey, et al., stated they felt children entering kindergarten do not have the necessary self-regulation skills needed to successfully engage in the classroom. Therefore, it is essential that early childhood education holds a strong focus on the development of self-regulation alongside instruction in academic content to effectively prepare each child to enter the kindergarten classroom ready for success.

Executive Function and Self-Regulation

Over the past decade there has been a growing body of research completed on executive function skills in young children (Moreno, et al., 2017). Before this time, executive function was not thought to be applicable to young children at all, however, this current body of research indicates not only is it applicable, but it is also a critical foundation for school readiness and academic performance (Moreno, et al., 2017). In studies by Blair & Raver (2015) and Booth, et al. (2018), the researchers concluded that executive function skills are more indicative of early school success and overall academic achievement than the child's general intelligence. These results strongly support the belief that early childhood educators have a unique opportunity to foster growth in social-emotional development through the lens of executive functions.

Executive function is at the heart of self-regulation. It is not just one skill, but instead a group of higher order thinking skills that help individuals to focus on more than one task at the same time, watch for errors, use all available information to make a decision, change plans when needed, and to control the urge to make quick decisions based on frustration (Matte-Gagne, et al., 2014). This set of skills is described to be like an air traffic controller in the brain (Raver & Blair, 2016; Center on the Developing Child at Harvard University, 2011). Neuroscientists highlight three dimensions of brain function, working memory, cognitive flexibility, and inhibitory control, as primary to executive function skills (Blasco, et al., 2014). Working memory is the ability to both retain and retrieve stored information while blocking out any distractors (Bolton & Hattie, 2017), while cognitive flexibility is the ability to shift attention between different tasks (Booth, et al., 2018), and inhibitory control is the ability to control strong urges to stimulation when necessary (Blair, et al., 2015). An In-Press report published by Weintraub, et al. (2013), indicates the development of executive function skills begins as soon as the child is born, with the potential of rapid growth from the ages of three to five, and then continues steadily through adolescence.

Even though executive function skills begin to develop as soon as the child is born, it is important to remember that the child is not born with the natural ability to create a plan, maintain focus, or control impulses (Rosas, et al., 2019). However, each child is born with the potential to strengthen these capacities depending on the quality of their early life experiences (Diamond, 2016). According to The Center for the Developing Child at Harvard University (2011), a child's genetic make-up provides the blueprint, but the environment the child is exposed to, has the power to chemically mark genes and control their function. This chemical signature is written on top of the gene without altering the genetic code and influences how the genetic potential is

expressed in the frontal lobe of the brain (Booth, et al., 2018; The Center for the Developing Child at Harvard University, 2011). Simply stated, the brain learns to adapt itself to the experiences it is exposed to.

Therefore, the importance of developing these essential executive function skills in the preschool classroom cannot be overstated. There will be natural differences in the pace of each child's skill development, yet each child has the potential to strengthen those skills through the quality of interactions provided them (Diamond, 2016). According to Blasco, et al. (2014), adverse early experiences such as abuse, low socioeconomic status, low birth weight, prematurity, prenatal fetal alcohol exposure, stress, and negative parenting can negatively impact the development of executive function skills.

According to Williams (2018), executive function falls under the umbrella of self-regulation. Lonigan, et al. (2017) goes on to describe self-regulation in the broader terms of one being able to control cognition, behavior, and emotion in response to any type of stimuli, situation, or demand. Bater & Jordan (2017) provide the definition of self-regulation as including two specific perspectives: the first, cognitive perspective which consists of the three aspects of executive function and the second being the behavioral perspective which consists of the ability to exhibit effortful control. To be successful in completing an activity or goal, the child must be able to regulate both their attention and behavioral responses (Bater & Jordan, 2017).

The development of self-regulation begins in infancy (Montey, et al., 2016; Sawyer, et al., 2015) and during the ages of three to five there is also a period of more rapid development which is similar to what researchers have determined about the development of executive function skills. Also similar to executive function, self-regulation is influenced by both genetic and environmental factors (Bolton & Hattie, 2017) and the rate of development can vary for each

individual child (Montrey, et al., 2016; Sawyer, et al., 2015; Montrey, et al., 2016: Razza, et al., 2015).

Both executive function and self-regulation are related to school success (Bolton & Hattie, 2017; Williams, 2018; Viglas & Perlman, 2017). Another similarity between executive function and self-regulation reported in studies by Lonigan, et al. (2017) and Sawyer, et al. (2015) confirm that children who have lower skills levels of self-regulation will also have higher incidents of behavior problems, less motivation to finish learning tasks, and overall, have many social difficulties in school (Fitzpatrick, 2012). Therefore, the development of both self-regulation and executive function during this time of accelerated development is critical (Bolton & Hattie, 2017; Flook, et al., 2015) and will have a lasting impact on the child's future relationships, their ability to engage in learning, follow rules and expectations, and calm themselves during frustrating situations (Fitzpatrick, 2012; Sawyer, et al., 2015).

Research-based Strategies and Interventions

No matter what their current level of executive function skills, there are activities and strategies that can be easily incorporated into the daily routines which will promote the development of cognitive flexibility, inhibition control, and working memory in every child (Blasco, et al., 2014). This does not mean that a focus on building self-regulation and executive function skills should take precedence over the child's cognitive development (Bater & Jordan, 2017), but instead it should be recognized that growth in these skills will also set the stage for cognitive growth (Blair & Raver, 2015). In fact, early learning that emphasizes the development of self-regulation, executive function skills, as well as academic skills is most effective in promoting school readiness (Blair & Raver, 2015). Preschool teachers can play a key role in the process of growing the child's executive function and self-regulation skills (Fitzpatrick, 2012;

Hughes & Devine, 2019; Moreno, et al., 2017; Nesbitt, et al., 2015; Raver & Blair, 2016) as they do spend a great deal of time and have numerous opportunities each day to both nurture and educate the child (Fitzpatrick, 2012). As early childhood educators build these positive and warm relationships with each child, establish high expectations and classroom routines, and provide opportunities for the child to practice using their executive function skills, it will promote growth in these skills and further ready the child to enter the kindergarten classroom (Bater & Jordan, 2017; Viglas & Perlman, 2017).

It is not enough for teachers to simply understand the importance of executive function but instead they must provide coaching and support as children interact with their peers, extending conversations by asking open-ended thought provoking questions versus just making affirming comments, and helping the child build connections between prior and present learning (Moreno, et al., 2017). Providing early interventions is essential to help those students who struggle with any of the components of executive function so they can be successful in their school performance (Diamond, 2016).

An important practice ground for the development of executive function skills is dramatic play (Rosas, et al., 2019; Moreno, et al., 2017; Walker, et al., 2020). For example, as a group of students plays in the dramatic play areas of the classroom, they create a plan based on the information they all know about the topic of their imaginative play, then they can determine what role each peer will be assigned, remember these plans, while sustaining their character's persona while adapting their character to the different scenarios in ways that are logical and continue the natural flow of the scene (Rosas, et al., 2019; Moreno, et al., 2017; Walker, et al., 2020). When first entering the preschool environment, the child will have difficulties keeping up with prolonged dramatic play and will benefit from the teacher providing scaffolding by helping them

make a play plan, choosing a role, and even drawing out the plan on paper (Rosas, et al., 2019). Additionally, having a responsive adult close-by who can guide these individualized interventions in the context of the problem, will further scaffold the child's developing executive function skills (Rosas, et al., 2019).

According to studies by Flook, et al. (2014) and Viglas & Perlman (2017), evidence suggests that implementing mindfulness practices can have a positive impact on attention while reducing impulsivity. Mindfulness practices are described as activities that promote focus and awareness on one's own body and emotions and recognizing when that focus has been disrupted (Flook, et al., 2014). Wolff & Stapp (2019) suggest that combining mindfulness with yoga in the preschool classroom not only improves executive function, self-regulation and decreases stress, but also benefits the student's physical development. By adding the emphasis on breathing, stretching, and using mindfulness, the positive benefits to growth in executive functions become even more substantial (Wolff & Stapp, 2019). In fact, the research has shown that students who were reported to have the lowest levels of executive function had the strongest growth in executive function skills when placed in the intervention group as compared to the control group who did not participate in the mindfulness yoga activities (Flook, et al., 2014). Overall, the results of these three studies prove that combining yoga, breathing, and other mindfulness activities in the preschool classroom are beneficial to strengthening executive function skills.

A study conducted by Rosas, et al. (2019) discovered that using board games, song games, and movement in the preschool classroom can also promote the development of executive function skills in young children. Games involving sorting objects into different categories and then sorting them again using different characteristics will promote cognitive flexibility in preschool aged children (Rosas, et al., 2019). Teachers play a key role as they

provide scaffolding when the child struggles to switch sorting rules (Rosas, et al., 2019). Other suggestions made by Rosas et al. (2019), include providing a selection of increasingly complex puzzles which will promote challenges in visual working memory and planning skills. Traditional board games such as Checkers, Connect Four, Qwirkle, Bingo, and Jenga provide healthy challenges and practice in using executive function skills (Rosas, et al., 2019). Executive function is further supported by songs and movement games as children learn to synchronize words to actions and move to specific rhythms (Williams, 2018). As research has linked these play-based activities with growth in executive function skills, they have been included as interventions in this action research project.

Summary

Examining this research provides a deeper understanding of the relationship between executive function skills and the child's ability to self-regulate. It is clear that despite popular belief that challenging behaviors are intentional and therefore, should be disciplined, the most effective approach for early childhood educators is to introduce research-based interventions that will aid in laying a strong foundation for the continued development of executive function skills. All these studies not only point to the positive impact these early interventions will have on the child's behavior, but prove that stronger executive function skills result in positive outcomes in future academic experiences.

Methods

Research Questions

This Action Research Project was steered toward the application of the subsequent research question: Will implementing research-based interventions promoting growth in executive function skills in an early childhood setting help students increase their EFgo

assessment scores and lower the incidents of dysregulated behaviors?

Variables

In this action research project, the independent variable was the introduction of research-based strategies and interventions which promote growth in executive function skills. The two dependent variables are the trendlines in the student's EFgo assessment scores (Carlson & Zelazo, 2017), that measure executive function skills and the trendlines in the number of dysregulated behaviors for each student. There are confounding variables present in this study including ethnicity, gender, learning disabilities, socioeconomic status, and Dual Language Learners.

Setting and Participants

The location where this action research project took place is a state funded preschool classroom located in a district where there are thirteen PK-5th grade primary schools. The school, Hunt Elementary, serves a population consisting of extremely high levels of poverty and a large variety of diverse cultural backgrounds. The classroom is set up for a total of twenty students, fourteen general education students who are four years old at the beginning of the school year, and up to six students, aged three to four, who are currently on an IEP. At the beginning of the school year there were a total of seventeen students, thirteen general education students and four special education students. During the school year, two students moved and another student who was demonstrating developmental delays was placed on an IEP. This increased the number of special education students to five. There was another student who was being evaluated for an IEP due to developmental delays, while the research was being implemented. Furthermore, there was one student on a speech IEP, and two students who had a behavior intervention plan. Three of the fifteen remaining students attended during the morning only and were excluded from the

research since they were not able to fully participate in the strategies and interventions planned throughout the school day. Three of the students on IEPs were unable to complete the EFgo assessment (Carlson & Zelazo, 2017) after two attempts and therefore were also excluded from the action research project. Classroom support for all students was provided by one certified early childhood special education teacher and two paraeducators.

The overall demographics for this elementary school include having 308 students currently enrolled with 49% female and 51% male students and 84.6% minority population (Iowa Department of Education, 2020). According to the Iowa Department of Education (2020), Hunt ranks in the top 5% of schools in the state of Iowa with highest percentages of students eligible for free lunches (Iowa Department of Education, 2020). In addition, the school ranks in the bottom 50% of Iowa schools in the number of students proficient in math and literacy (Iowa Department of Education, 2020). The Iowa Department of Education (2020) further reports there are currently 48 students who are on IEPs supporting academics, speech, and behaviors.

Interventions

The research-based strategies chosen for implementation include instructional practices that will be embedded throughout the day. The practices that will be embedded throughout the day include scaffolding learning activities, activating students' prior knowledge before adding new concepts, providing think time, adding pair-share during large group discussions, pre-teaching vocabulary, and modeling metacognition during problem solving (Moreno, et al., 2017). As these strategies are used the researcher will be able to make instructional decisions and adjustments that are both meaningful and target the best practices (Moreno, et al., 2017).

In addition, the following three research-based interventions have been chosen for implementation during specific components of the daily schedule. A mindfulness yoga class will

be included in our afternoon large group gathering that focuses on practicing breathing and relaxing techniques, performing controlled body movements, and stretching (Wolff & Stapp, 2019). A visual choice board will be introduced for both morning and afternoon recess that includes, “Red Light, Green Light”, “Simon Says”, “Duck Duck Goose”, “Mother May I”, “What time is it Mr. Fox” and “Freeze Dance”. During both morning and afternoon free choice an adult will provide support in the development of a play plan during dramatic play (Rosas, 2019).

Bailey and Carlson (2019) stated that one of the most important elements of building executive function in students is the teacher’s own ability to self-regulate and therefore, this was also considered a necessary part of the intervention process. As the teacher self regulates, they can effectively guide the student through potentially stressful events that occur in everyday life while also building the student’s executive function skills in the process. Much emphasis will be placed on the teacher and both paraeducators to remain calm and intentionally provide an environment where students feel safe to practice executive functioning skills at progressively more advanced levels.

Data Collection

For this action research project, the data collection is quantitative and includes two data sets. The first data set will include utilizing the Minnesota Executive Function Scale, referred to as Efgo (Carlson & Zelazo, 2017) to administer a pretest to determine each student’s baseline score in executive function and then again after six weeks to determine the overall growth in executive function over the school year. This assessment is designed for children aged 2 and up and is available as an app for i-pad touch-screen tablets. It includes avatars, graphics, and instructions that are child friendly. The EFgo assessment (Carlson & Zelazo, 2017) is adaptive to

each child's ability and takes an average of four minutes to complete. The individual and group reports are scored automatically, and the quantitative results are available immediately after the testing is completed. This assessment was chosen based on extensive reliability and validity testing results (Carlson & Zelazo, 2017).

The second data set will include utilizing a frequency data collection tally sheet to record quantitative data on how often incidents of dysregulation occur in the classroom. The data from the daily sheets will be transferred to an EXCEL spreadsheet at the end of each day (Mills & Gay, 2019). Periodic analysis and comparisons will be completed to determine if interventions are having a positive effect on each student's ability to self-regulate (Mills & Gay, 2019).

Data was collected over a six week period of time. All data was stored within the classroom setting and only shared for educational purposes. Each students' initials were used as identification to ensure fidelity.

Procedures

The baseline data for this action research project took place during center time, over a two day period of time. The researcher assessed each student individually in a one-on-one setting outside of the classroom. The EFgo assessment (Carlson & Zelazo, 2017) is not a timed assessment and automatically adjusts the level of difficulty as the child is completing it. The beginning level has the child sort cards that have either a lion or monkey, by color (Carlson & Zelazo, 2017). There are two boxes for the child to drag the cards into: an orange box with a monkey and a green box with a lion. The cards include both green and orange monkeys and green and orange lions. The assessment does have scripted verbiage at the top of the screen which the researcher repeated as directed throughout the testing. The EFgo assessment (Carlson & Zelazo, 2017) automatically adjusts the level of difficulty, and the child is instructed to sort

the cards by shape. The change occurs rapidly and requires the child to shift their focus, disregarding the color of the shapes. If the child demonstrates proficiency at this level the assessment (Carlson & Zelazo, 2017) automatically adjusts to add a black border on cards that should be sorted by shape and no border around cards that are sorted by color. At this level, the scripted instructions are provided at the beginning of the assessment with minimal scaffolded prompts while the child completes the task (Carlson & Zelazo, 2017). The assessment took an average of four to six minutes for each child to complete.

After each child completed the baseline assessment, the implementation of interventions occurred. As previously mentioned, these interventions included introduction a mindfulness yoga program (Flook, et al., 2014; Viglas & Perlman, 2017; Wolf & Stapp, 2019), a choice board during both recess times (Rosas, et al., 2019), and providing adult support during centers to develop a plan for dramatic play (Rosas, et al., 2019; Moreno, et al., 2017). Scaffolded teaching strategies were embedded throughout each component of the daily schedule (Moreno, et al., 2017).

A frequency data collection tally sheet was used to immediately record incidents of dysregulation in each child. The researcher defined dysregulation as situations where the child's emotional reactions are more intense than the typical reaction would be such as not being able to soothe and calm down, avoiding more difficult emotions, and persevering on negative thinking (APA Dictionary of Psychology). Behaviors the researcher recorded on the tally sheet included any incidents of physical aggression such as hitting, biting, pushing, kicking, taking toys away from peers, throwing furniture or materials, cussing at peers and/or teachers, and leaving the group without permission when used as an avoidance behavior. The researcher collected the data over a six week period of time.

After six weeks of interventions being implemented, the researcher administered a posttest using the EFgo assessment (Carlson & Zelazo, 2017). The researcher followed the same procedures as mentioned above while administering this post assessment.

Plan for Analyzing Data

This action research project will evaluate the effectiveness of providing research-based strategies that promote growth in executive function skills and the impact this growth has on the child's ability to self-regulate. Data will be analyzed first by using dependent sample t-tests for both data sets to determine rates of growth. The trendlines will be evaluated to determine an upward trend for the EFgo assessment results (Carlson & Zelazo, 2017), indicating growth in executive function skills, and a downward trend for incidents of dysregulation which will indicate growth in each child's ability to self-regulate. Finally, a correlation analysis will be completed to determine whether a relationship exists between growth in executive function skills and the number of incidents of dysregulation.

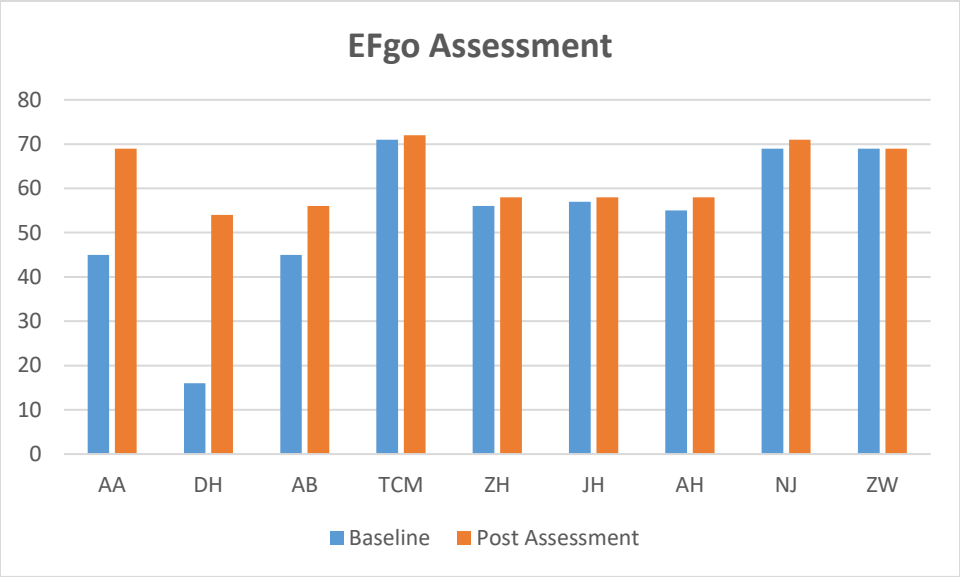
IRB Information

Due to the nature of this research, IRB approval was sought and approved. Each child's parent/guardian was approached to explain the purpose of the study, the assessment that will be utilized, and the intervention strategies chosen for implementation. Further explanation and reassurance was presented letting the parent/guardian know that instructional adjustments would be made if any skill regression is evident. Parents/guardians were told that their child's individual results would be shared at a debrief session when the study ended. The parent/guardian were then asked to sign the consent form or return the consent form once they have had time to review it. Each child's parent/guardian did sign the consent form giving permission to include their child in the study.

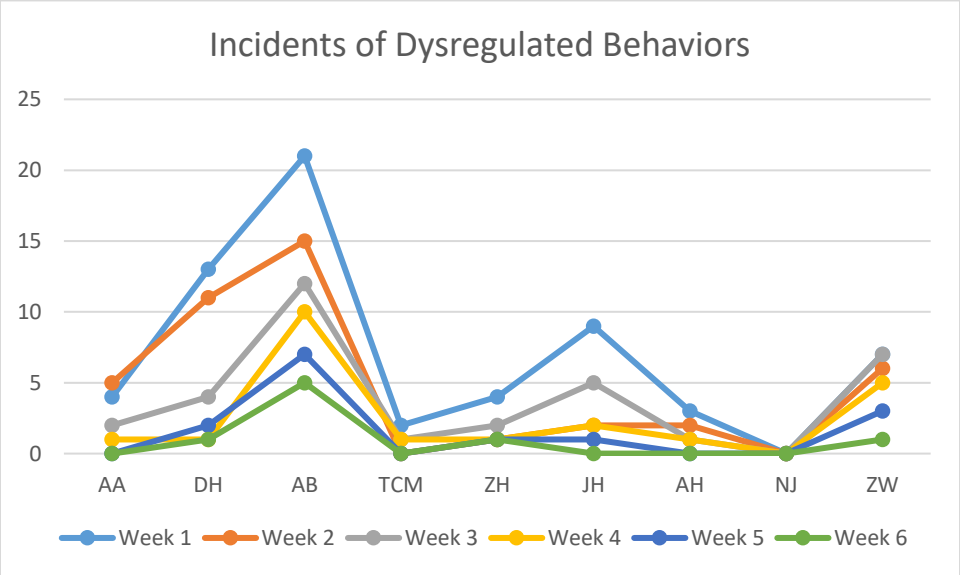
Findings

Data Analysis

A dependent sample t-test was completed to determine if there were significant changes in students' executive function skills following the chosen intervention strategies (Flook, et al., 2014; Viglas & Perlman, 2017; Wolf & Stapp, 2019; Rosas, et al., 2019; Moreno, et al., 2017). The baseline assessment (Carlson & Zelazo, 2017) revealed the students were able to correctly complete an average of 53 of 100 (M=53.66, SD=17.17) task opportunities. Following six weeks of the implementation of intervention strategies, the assessment was repeated. The students were able to correctly complete an average of 62 out of 100 (M=62.77, SD=7.26) task opportunities. Eight of the students did demonstrate an increase in their assessment scores and one student's scores were the same. However, the results of the dependent samples two-tailed t-test did not reveal a significant difference between the baseline and ending assessment scores, $t(7) = -1.59$, $p > .05$. This would indicate that there is a slight possibility that the increase in assessment scores was due to chance and the null hypothesis was correct ($> .05$).

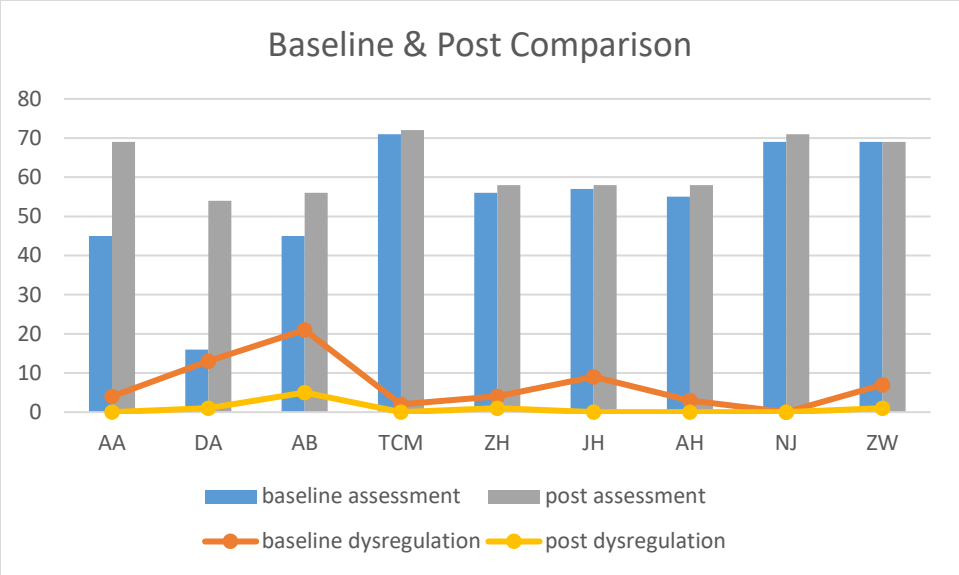


A single-factor ANOVA test was completed to determine whether there were significant statistical differences between the means of the number of incidents of dysregulation during the six weeks of intervention implementation (Flook, et al., 2014; Viglas & Perlman, 2017; Wolf & Stapp, 2019; Rosas, et al., 2019; Moreno, et al., 2017). All of the nine students decreased their number of incidents of dysregulated behavior consistently over the course of the six weeks. However, the single-factor ANOVA revealed there was not a statistically significant difference between the interventions and the number of incidents of dysregulated behaviors, $F(5, 42) = 2.23$, $p = .069$. This would indicate that once again there is a slight possibility that the decrease in incidents of dysregulated behaviors was due to chance and the null hypothesis was correct ($> .05$).



A Pearson correlation test was completed to determine the relationship between the assessment scores measuring executive function skills (Reflective Sciences, 2019) following the six weeks of interventions (Flook, et al., 2014; Viglas & Perlman, 2017; Wolf & Stapp, 2019; Rosas, et al., 2019; Moreno, et al., 2017) and the final weeks report of the incidents of dysregulated behavior. Once again, the results revealed there was not a significant statistical

difference between the final assessment scores and the number of incidents of dysregulated behaviors, r (8) = -.40, p = .25 (> .05). This result again indicates the increase in assessment scores measuring executive function skills and the decrease in incidents of dysregulated behavior may be due to chance and therefore, the null hypothesis was correct (> .05).



Discussion

Summary of Major Findings

The action study results indicate to researchers, educators and stakeholders that implementing strategic research-based interventions that promote the growth of executive function skills in preschool aged children can assist in the development of these important skills. Results of the study indicate that 89% of the children demonstrated growth in their executive function skills. Of the students who made growth, the average score results increased by 9 points. In addition, 100% of the children decreased the number of dysregulated behaviors from an average of 7 per week to .88 per week. Even though the statistical testing revealed a slight chance the results were due to chance and not as a direct result of the interventions implemented,

the students all made growth in both their executive function and self-regulation skills. These results do indicate that implementing targeted research-based teaching strategies and interventions designed to promote growth in executive function skills will not only have a positive impact on these skills but also strengthen each child's ability to self-regulate (Williams, 2018).

The students were able to successfully complete the six-week intervention by participating in the chosen methods with fidelity when they were presented. Through explicit instruction, modeling, and scaffolding of the skills, the children were able to practice them at their independent level before interacting in the activities (Rosas, et al., 2019). Due to the dependency of this age group, throughout the interventions the researcher was responsible for providing each student with updates on their progress and to provide consistent immediate verbal feedback to motivate and encourage them (Diamond, 2016). In addition, redirection was provided as needed.

Overall, implementing meaningful and intentional research-based instructional strategies and activities that promote the growth of executive function skills, providing immediate feedback, and making frequent adjustments to meet the needs of each individual student, is effective in increasing executive function skills and lowering the incidents of dysregulated behavior. Increasing executive function skills sets the stage for successfully preparing each child to enter the kindergarten classroom ready to face the challenges that formal education necessitates (Moreno, et al., 2017).

The findings of this project support the current literature and those that were reviewed relating to the importance of promoting growth in executive function skills as a critical foundation for school readiness and future academic outcomes (Moreno, et al., 2017; Blair &

Raver, 2015; Booth, et al., 2018). Furthermore, the findings support the results from Rosas, et al. (2019) and Diamond (2016) which indicate each child is not born with the ability to create a plan, maintain focus on a task, or control their impulses, but through intentional instruction and support these skills can be strengthened.

Limitations of the Study

This study did present some limitations during the process that could have potentially impacted the outcomes. First, because the study was conducted with one classroom of students at one small elementary school, the findings cannot be generalized to the national population of preschool aged students (Mills & Gay, 2019). Therefore, the results may be limited to classrooms with similar demographics. The second limitation is related to the sample size of participants (Mills & Gay, 2019). The number of students in the sample classroom was small at the start of the study, and then reduced in number to participants who met the qualifications set by the study design. The third limitation was the timing of the study both in length and the time of the school year in which it was conducted (Mills & Gay, 2019). The baseline started six weeks before the end of the school year, after students had already been exposed to the typical activities and routines found in the preschool setting. Therefore, the baseline may not have been the same if it would have been administered at the beginning of the school year. Gathering a significant amount of data was limited to only the six weeks of data collection that occurred during the study. Finally, due to staff break times and the frequent presence of high needs behaviors that required immediate teacher support, the teacher may not have always been available promptly to help direct and support students during the designed activities when needed.

Future Study

The next step will include implementing this research with another class of students

within the same classroom setting during the upcoming school year. This current research was completed over a six week period of time at the end of the school year. While the results do show a positive relationship between the interventions and the growth in executive function and self-regulation skills, future research should include testing these interventions over a longer period of time. Students will be presented with the same interventions of introducing a mindfulness yoga program ((Flook, et al., 2014; Viglas & Perlman, 2017; Wolf & Stapp, 2019), a choice board during both recess times (Rosas, et al., 2019), and providing adult support during centers to develop a plan for dramatic play (Rosas, et al., 2019; Moreno, et al., 2017, Walker, et al., 2020). Scaffolded teaching strategies will continue to be embedded throughout each component of the daily schedule (Moreno, et al., 2017). The EFgo assessment (Carlson & Zelazo, 2017) will be used to determine a baseline for each student during the first two weeks of school and will be readministered at the end of December and then repeated again at the end of the school year. The number of incidents of dysregulated behaviors will also be tracked throughout the school year. This will provide a larger collection of data that will be used to determine trends in the growth in executive function and self-regulation skills for each student over the course of the entire preschool year.

Another future step will be to monitor the students included in this study as they adjust to the kindergarten classroom, measuring both social and academic performances. The information gleaned will be used to adjust the future interventions provided in the preschool classroom to promote growth in executive function and self-regulation skills.

Finally, future studies should be considered with a larger number of participants in other inclusive preschool classrooms within the school district. A larger participant size would provide opportunities for more generalizations about the effectiveness of the research-based interventions

and further validate the results of the study (Mills & Gay, 2019).

Conclusions

This study aimed to investigate if executive functioning skills can be strengthened through interventions provided in the preschool classroom and if there is a relationship between strengthening these skills and seeing a decreased number of dysregulated incidents in these same children. In retrospective research studies reviewed by this researcher, it was found that if deficits in executive functioning skills are not addressed, development trajectories will be negatively impacted throughout the individual's life (Moreno, et al., 2017; Blair & Raver, 2015; Booth, et al., 2018). By targeting the development of executive function and self-regulation skills during the preschool years, the time when the growth potential has been determined to be the highest (Rosas, et al.,2019; Diamond, 2016), early childhood educators have the potential of buffering or ameliorating these deficits before the student begins kindergarten (Moreno, et al., 2017). There is a need for more evidence-based practices to be identified, but it is the hope of this researcher that with early practice using these skills in real life experiences, that executive function and self-regulation skills can be improved, thus better preparing these young students for their future, at home, in, school, and at work.

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