

Reading Comprehension and Working Memory

By June M. Latorre

Submitted in Partial Fulfillment of the Requirements for the
Degree of Master of Education

May 2021

Graduate Programs in Education

Goucher College

Table of Contents

List of Tables	i
Abstract	ii
I. Introduction	1
Overview	1
Statement of Problem	3
Hypothesis	3
Operational Definitions	3
II. Review of the Literature	5
Introduction	5
Executive Function Skills and Learning	6
Strategies to Teach Executive Function Skills	8
Conclusion	9
III. Methods	11
Design	11
Participants	11
Instrument	12
Procedure	13
IV. Results	15
V. Discussion	16
Implications of Research	16
Theoretical Implications	17
Threats to Validity	17

Connections to Literature	18
Implications for Further Research	19
Summary	20
References	21

List of Tables

1. Means, Standard Deviations, and t-statistic for comprehension	15
--	----

Abstract

This research sought to examine the impact of a mindfulness/working memory intervention on reading comprehension skills of fourth grade students ($n = 8$) that received special education services for Attention-Deficit/Hyperactivity Disorder (ADHD). There was no significant difference in the reading comprehension scores before (Mean = 3.14, SD = .90) and after (mean = 4.00, SD = 1.73) the mindfulness intervention [$t(6) = 1.87$, $p = .11$] that involved listening to Tibetan bells and performing deep breathing. Small sample size and virtual instruction may have impacted results; future research will need to consider learning environment, length of intervention and sample size.

CHAPTER I

INTRODUCTION

Overview

Learning in a traditional classroom environment or a virtual instruction situation is a process that requires the learner using a set of cognitive skills known as executive functions. According to Hagemeyer (2015), “It is believed that executive functions are cognitive processes that direct people’s actions, thoughts, and emotions. Academics affected by a deficit in executive function skills include reading, writing, arithmetic, socio-emotional development, and behavior. (p. 2). In learning, executive functions are used in all areas, as “executive functions contribute to the effectiveness and functionality of cognitive and metacognitive process. These functions are highly interactive and describe the way in which learners perceive sensory information, transform the information, store, retrieve and use the information in order to cope successfully with cognitive challenges” (Esterhuizen, 2014, p.113). Learners have varying levels of these skills, and studies have shown that when a learner has a higher level of these skills, their academic success is also higher as seen in grades, SAT scores and high school completion (Zelazo et al., 2016). The executive functioning skills that learners require for academic success can be taught, and there is a need to provide interventions and strategies in the classroom setting to support all levels of executive functioning skills.

When a learner has reduced executive functioning skills, they often struggle to attend to tasks, complete tasks, and follow directions to complete tasks, which directly impacts academic success. The demands of academic tasks in both traditional and virtual learning environments increase as learners move through school, and the need to examine what strategies or interventions support and strengthen those weaker skills. The effects of poverty, trauma,

genetics and pandemics have negative impacts on a young learners' cognitive skills, especially their executive functions.

Executive functioning deficits are not always connected to a student that has been identified as having attention deficit hyperactivity disorder but very often a student that struggles with executive function deficits is also identified as having attention deficit hyperactivity disorder, ADHD. According to Lauze (2020), "Attention deficit hyperactivity disorder is a neurodevelopmental disorder characterized by executive function and attention deficits" (p. 9). Students who struggle to demonstrate good working memory skills, have flexible thinking or inhibitory control will also struggle with academics regardless of what category they are placed into or specific weakness the student is identified as having.

This researcher's interest in executive function skills and how to improve them is deeply rooted in her working experience. As a special education teacher, the need to address working memory, inhibitory control, cognitive flexibility, and sustained attention are as important as the skills of reading, math and writing in elementary school aged learners. In every elementary school there are learners who are weak in one or more areas of executive functioning skills, and this researcher is interested in strategies to improve these skills. According to Lux (2020), "In everyday routines, children must solve problems, plan, and complete tasks by learning to control their thoughts, feelings, and behaviors, thus demonstrating strong EF skills to become more self-directed, self-regulated, and successful learners" (p. 5). Executive function skills are improved in learners through mindfulness, which provides them skills that allow students to be present in the moment in order to attend to an academic task. Mindfulness can be taught in different ways, and for the purpose of this study, students were taught to relax, breathe, and listen to Tibetan bells for three to five minutes while preparing their minds for the reading lesson each day.

Statement of Problem

The purpose of this study was to evaluate the reading comprehension of a small group of fourth grade learners, ages 9-10, after participating in daily mindfulness activities designed to increase their overall working memory skills. This group of students are all identified as having attention deficit hyperactivity disorder in their Individualized Education Plan (IEP) as a part of their specialized instructions services through special education. These fourth-grade students are currently identified as reading on a first-grade reading level on their IEP and receive small group instruction on their instructional level.

Hypothesis

The null hypothesis is that there will be no significant difference between reading comprehension scores on a Qualitative Reading Inventory before a mindfulness intervention as compared to the post reading comprehension scores after a mindfulness intervention in students identified as having attention deficit hyperactivity disorder

Operational Definitions

Reading Comprehension: Reading comprehension, for the purpose of this study, was defined as the correct responses to post reading questions on a Qualitative Reading Inventory. The passages used for both assessments were fiction and based on their instructional level as determined by the first part of the QRI. The questions assessed explicit and implicit comprehension. Explicit refers to questions that ask the reader to recall information that was provided directly in the text, like a character's name. Implicit questions ask the reader to understand implied information from the text.

Mindfulness intervention: Mindfulness is the practice of purposely bringing one's attention to the present moment through breathing, music, or any calming activity meant to bring

focus and attention to the present and prepare for a task, in this case, reading. Tibetan bells were used as students sat quietly and allowed their minds to relax in preparation for an academic task. The music of the bells was used to indicate the beginning and ending of the mindful act of quieting the mind.

Identified with ADHD: The group of fourth grade students in this study were identified as having ADHD as diagnosed in their IEP and therefore qualify for specialized instruction.

Working Memory: The ability to recall information from short term memory and manipulate it according to the needs of the task.

CHAPTER II

REVIEW OF THE LITERATURE

This review of literature discusses the impact of executive function on learning and whether learning can be improved by teaching executive function skills to students. The introduction of this literature review will define key terms such as executive function, working memory, cognitive flexibility and inhibitory control. The next section will describe how executive function impacts learning. Then a section will describe the factors that impact executive function skills when learning. The next section will cover strategies to teach executive function skills, and finally, there will be a summary of the ideas presented through this literature review.

Introduction

The definition of executive function has evolved over the years, and the most recent schools of thought currently describe executive function as a collection of functions that allow for sustained attention and goal completion. When specifically defining what those functions include, they are working memory, cognitive flexibility, and inhibitory control (Zelazo et al., 2016). They further explain: “These three skills depend on increasingly well understood neural circuits involving regions in the prefrontal cortex (PFC) and other areas of the brain, and hence may be described as neurocognitive skills” (p. 2). Working memory is part of the cognitive process that allows someone to hold on to information for short time, while at the same time accessing that information and manipulating it based on an academic demand in order to complete a task. Cognitive flexibility is the switching of one way of thinking or a topic to another. This can be thought of as seeing another point of view, switching topics all together or thinking about a problem in a different way. Inhibitory control is the ability to inhibit one’s

response or impulse and is often called flexible thinking. Executive functioning skills develop in early childhood and continue into mid-adulthood, but the skills are typically present around age 3 years. The impact of experiences, positive and negative also impact the development of executive function skills.

Executive functioning skills in pre-school aged students have shown that there is a correlation between academic success executive function, while students who struggle with one or all parts of the executive function experience lack of success in comparison. When evaluating studies and populations over time, these correlations proved to be indicators of future academic struggles or success in the classroom (Willoughby et al., 2017). Executive function skills are not the same as intelligence metrics, and it is important to understand that executive function skills can be taught and learned in a variety of ways. Studies have also been done to measure the connection between poverty and academic success, and often the results show that the students who did not score high on the assessments were impacted by poor executive function skill sets. While considering all factors that impact learning, weakness in executive function skills is found across socioeconomic levels and “these attentional skills allow students not only to learn more effectively, but also to take the content knowledge they have learned in the classroom and to apply it on an exam, or in their daily lives” (Zelazo et al., 2016, p. 3).

Executive Function Skills and Learning

Studies suggest that when the executive functioning skills are weak in preschool age, they can remain weak, and this can impact and indicate future academic success (Willoughby et al., 2017). According to St. Clair-Thompson (2011), “Measures of executive function performance during childhood and adolescence correlate strongly with concurrent measures of reading and math performance, as measured on standardized achievement” (p. 411). Learning begins from

the moment we are born, so the collection of experiences and skills are very different. When a child enters school, it is just as important to determine their reading readiness as their working memory skills. As educators, we must consider all possible modes of teaching and learning to reach as many students as possible and executive functioning skills are no different.

The connection between attention deficit and executive functioning skills is clear when reviewing the literature, and studies show that improvements in academic scores happen when these skills are taught, especially when incorporated in to the classroom as a 2014 study stated, According to Esterhuizen (2014), “These functions are highly interactive and describe the way in which learners perceive sensory information, transform the information, store, retrieve and use the information in order to cope successfully with cognitive challenges” (p. 115). As often as educators review and revamp literature strategies and math problem solving methods, as well as classroom management skills, there is much to learn about executive functioning skills and how they impact growth and development and how they impact students from the time they enter school. When reviewing literature for executive function, it can be easy to find studies on math facts skills and less on reading, but one study found “EF skills are strongly related to 9-year-old children’s academic learning but also highlighted that EF components differentially contribute to different scholastic domains” (Lubin et al., 2016, p. 451).

There is much debate in research studies as to which part of executive function applies to what subject and what strategies or interventions would support growth in what area based on those correlations. Lux et al. (2020) explains, “In every day routines, children must solve problems, plan, and complete tasks by learning to control their thoughts, feelings and behaviors, thus demonstrating strong EF skills to become more self-directed, self-regulated, and successful learners” (p. 5). Studies show that inhibitory control and flexible thinking are not an equal

indicator of reading success but related to math and problem solving (Lubin et al, 2016). Another study reviewed suggested physical activity, such as karate, to be helpful in the areas of inhibitory control and flexible thinking (Jacob & Parkinson, 2015). The link between executive function skills and academic success as measured by reading and math scores is clear. Data and studies show that when executive function is weak in one area or another, there are strategies to incorporate to improve those skills. Learning in school includes math, reading and writing, and all those tasks require some or all portion of executive functioning skills to be successful. To discuss learning, especially in a school setting and not include the executive function skills will surely result in some students who will not meet with success in one or more areas.

Strategies to Teach Executive Function Skills

When it comes to strategies studied to improve all areas of executive function skills, including working memory, flexible thinking and inhibitory control, there is no shortage of information and research. As witnessed in this recent pandemic and the institution of virtual learning, even our littlest learners are capable of a few minutes of a working memory game on the computer. Many of the articles reviewed shared strategies and interventions to teach, support and strengthen executive function skills, and many of the results of these interventions showed growth in the learning because of improved executive function skills (Jacob, 2015). CogMed, for example, is a computer-based activity that has shown to make significant gains in working memory for students who struggled in that area. Many of the strategies found during the review of literature specified age groups, specific areas of study and coexisting conditions such as autism, attention deficit or a low socioeconomic living condition. These strategies can vary from simple technology-based games that worked to improve working memory or social emotional skills to support needs the area of inhibitory control.

There is continued debate about the increase in executive functioning skills and whether these carry over into academics for students. It seems clear that the neediest students benefit most of all, and it should not be discounted for that reason (Diamond & Lee, 2011). Research suggests all schools should review how they can incorporate some executive function skills improvement. Weiland (2011) states the clear message: "From a developmental science perspective, this makes much sense as children's cognitive skills are malleable at a young age; thus, supporting their early development builds a strong foundation for later educational and intellectual success" (p. 1). There are many strategies available. Dini (2017) explains, "Many of the tools provided through the lesson plans including mnemonic devices, visual cues, check lists, and graphic organizers have been noted as being effective in aiding students' recall and organization of verbal information, learning of material in a logical format, and relate new information to old" (p. 15). This may seem daunting considering the extensive academic demands of educators, but when progress is the end result that all stake holders want to see, there is no reason not to begin to implement a few small strategies to enrich all learners. According to Zelazo et al. (2016), "Research has shown clearly that EF skills can be improved by relatively brief interventions that provide children with opportunities to practice their developing EF skills at increasing levels of challenge" (p. 3). Strategies like mindfulness, relaxation training, and positive mental imagery, for example, showed an impact in the inhibitory control area of executive function skills. When positive impacts are made on executive function skills, positive impacts can be seen in educational success.

Conclusion

Executive function skills are key for learning and academic success. Students who struggle in one or more areas of executive function or have coexisting issues will consistently

show lower academic scores when compared to peers who show a mastery of these skills.

Interventions addressing one or all of these areas considered in executive functioning have been studied and proven to encourage growth in those areas and thereby growth in academic success.

CHAPTER III

METHODS

The purpose of this study was to determine if a mindfulness intervention with a small group of students improved their post reading comprehension questions as measured by the Qualitative Reading Inventory.

Design

This study used a pre-experimental, one group pretest-posttest design. The pretest and posttest were administered using the Qualitative Reading Inventory V. This study used a purposive sample of eight fourth grade students who have been diagnosed with ADHD, are reading below grade level, and receive special education services. The independent variable in this study was whether the students received the intervention in the study, a mindfulness strategy for the first five minutes of each group daily, where the students were asked to listen to Tibetan bells and take deep breaths to relax and be ready to focus on the reading lesson. The dependent variable was change in pre and post mindfulness intervention reading comprehension scores on a narrative text passage from the Qualitative Reading Inventory 5.

Participants

The students in this study were selected from fourth graders who are currently receiving specialized instruction for ADHD and all currently read at least two grade levels below expectations based on the most recent I-Ready data as administered by the school. This group of students have been identified as having ADHD as indicated on their IEP by the school psychologist involved in the process. The school is identified as a Title 1 school based on the community's low socioeconomic status, and it is located in a suburban area. The group of eight students selected currently work with the researcher daily in small group pull out services based

on their Individualized Education Plan. Of the eight students, there are four females and four males. Of the eight students, four are African American and four are Caucasian. The eight students range in age from 9 to 10 years old and are currently in grade 4 at their elementary school.

Instrument

The Qualitative Reading Inventory-5 (QRI-5) is an individually administered informal reading assessment designed to provide information about a student's ability to identify words from a list to help determine current reading level and then to read a passage and demonstrate comprehension by responding to post reading implicit and explicit questions. Prior to reading the selected passage, the examiner asks listed questions to ensure the student has enough background knowledge on the subject to make the assessment results reliable. The reader is also then given the title of the passage and asked to make a prediction about the story they will read. The assessor measures the reader's miscues while reading orally, measures recall of information after reading and then comprehension questions all completed orally in a one-on-one situation on a virtual learning platform. These scores are then compared to a chart that indicates if the reader has mastered that level and needs to go further or has reached a level of frustration. For this study, the reading comprehension scores were the scores of interests.

The Qualitative Reading Inventory 5 test manual discusses reliability and validity data. It has been deemed reliable by the consistency of score reproduction for an individual. The scores are consistent in inter-scorer, internal consistency, and alternate-form reliability. There is evidence of validity for prior knowledge, oral reading, miscue analysis, reading rate, reading recall and comprehension questions.

Procedure

The group of eight fourth grade students, who received daily specialized instruction in reading comprehension through a virtual platform, were instructed on strategies to improve their comprehension as measured by post reading explicit and implicit questions as part of standard instructional procedures that this researcher, the special educator, has been following since 15 September 2020. The students are provided a new fiction passage each session, and the text is read to them either by an electronic assistance program (Google Read & Write extension) or the examiner. The passage is then reviewed for unfamiliar words or phrases. Students are asked to read the passage a second time to themselves, and they ask for assistance with decoding as needed. The students are then asked to respond to comprehension questions either orally with the answers recorded by the examiner or the student is provided with electronic documents where they can choose a correct response from several choices or they have to compose (with and without electronic assistance) a written response. The activities vary slightly each session and support is provided throughout the entire lesson. Students are provided opportunities for correcting their work and asking clarifying questions. For the first four out of the five days, the answers are discussed and not graded in this activity. The examiner reviews why certain choices from a selected response are not correct and how the correct response is proven by returning to the text to confirm. The QRI assessment is different from the daily lessons in that the answers are not multiple choice, and they are allowed only one read through of the text passage. The questions and answers are collected orally, and no visuals are offered when responding to the questions.

This group of students currently reads independently on a grade 1 level, and therefore texts are chosen to be on a topic related to fourth-grade standards but on a level that allows them

to access the information independently as often as possible. The passages are selected from Readworks.org, an approved website in the school system that supports the virtual platform of instruction at this time. The passages are instructional level appropriate to allow for independent reading after oral reading. All passages are fiction and ask explicit, implicit, and short answer post reading questions.

For the research, the examiner did a pre assessment of reading comprehension using a Qualitative Reading Inventory V. The students were then introduced to mindfulness in our small group by a discussion and then video designed for children on being present in the moment and how that is achieved through meditation, deep breathing, and positive thoughts. During each session, the students listen to Tibetan bells for a period of five minutes while breathing and are asked to relax and think about what they need to do to be able to focus on the lesson. After the five-minute mindfulness intervention, students are introduced to the day's passages, read to, then re-read independently in preparation for post reading comprehension questions. This procedure was introduced on 1 March 2021, in a small group virtual instruction session and continued for three weeks on three out of 5 days per week minimum. After the three weeks of intervention, the post Qualitative Reading Inventory V was administered.

The difference scores between the pre- and post-Qualitative Reading Inventories were compared with a non-independent samples t-test. Two different passages were used, and both were narrative fiction on a level one, which is their current independent reading level as predetermined using the present levels on their IEPs.

CHAPTER IV

RESULTS

This study examined the effectiveness of a five-minute daily mindfulness strategy in which fourth grade students were asked to listen to Tibetan bells and take deep breaths to relax and be ready to focus on the reading lesson.

A non-independent samples t-test was conducted with the independent variable being whether the students had received the intervention and the dependent variable being change in pre and post mindfulness intervention reading comprehension scores on a narrative text passage from the Qualitative Reading Inventory 5.

There was no significant difference in the reading comprehension scores before (Mean = 3.14, SD = .90) and after (mean = 4.00, SD = 1.73) the intervention [$t(6) = 1.87, p = .11$]. Please see Table 1. Consequently, the null hypothesis that there would be no significant difference between reading comprehension scores on a Qualitative Reading Inventory before a mindfulness intervention as compared to the post reading comprehension scores after a mindfulness intervention in students identified as having ADHD was retained.

Table 1

Means, Standard Deviations, and t-statistic for comprehension

Condition	Mean	SD	t-statistic
Before Intervention	3.14	.90	1.87 (NS)
After Intervention	4.00	1.73	

N = 7

NS = non-significant at $p \leq .05$

CHAPTER V

DISCUSSION

The purpose of this study was to determine if the implementation of a classroom intervention targeting mindfulness and working memory impacts students' comprehension scores as determined by a Qualitative Reading Inventory 5 assessment. The null hypothesis was that there would be no statistical difference between reading comprehension score on the QRI5 before receiving a working memory intervention as compared to reading comprehension scores after a working memory intervention. The results of the study showed that the null hypothesis was retained for measures of reading comprehension in post reading comprehension questions assessments.

Implications of Results

The results of this study indicate that a working memory intervention in the classroom improved some post reading comprehension questions scores, but not for all participants. The difference in scores was not significant, suggesting the intervention was not very effective in impacting reading comprehension as measured.

Although the mindfulness intervention did not have a significant impact on reading comprehension scores, the researcher observed some benefits from the intervention. The students requested a mindfulness activity when in small group, suggesting that they found some value in the activity. The mindfulness intervention was quick, easy to incorporate, and did not cost any money. Any classroom could use this or a similar mindfulness practice and potentially see growth in their students. At the very least, it will support relationship building in the classroom.

Theoretical Implications

The results of this study indicated that a working memory intervention provided to a small group of fourth grade students, all identified with ADHD, did not significantly impact post reading comprehension scores. This is consistent with the idea that addressing an information processing component of a larger skill does not necessarily lead to improved performance on the larger task. The students did enjoy the mindfulness activities and asked to continue with them in the group even after the study was completed. This study aligns with the data that Zelazo et al. (2016), who shared that “A number of working memory training studies have been completed with children with developmental disorders, such as attention deficit hyperactivity disorder (ADHD). As with the working memory training literature generally, however, conclusions are mixed” (p. 64).

Threats to Validity

This study had both external and internal threats to validity that could have impacted the results. There were threats to external validity impacting the ability to generalize the results. First, the participant group was relatively small and lacked diversity as they were all students identified as having ADHD and received special education services are a part of their IEPs. Results cannot be generalized to children without ADHD. It is possible that children with ADHD need more explicit instruction and practice in mindfulness activities than children without these difficulties. They may have not been on task and focused for the intervention or the reading lessons. This group also lacked diversity in their socioeconomic background as all of them reside in the community that the school supports, and the school is a Title 1 school. The intervention may have a different impact among students from a higher socioeconomic status. This group of participants are also all in the fourth grade and fall between 9 and 10 years of age,

and the threat to validity could be that the intervention may work differently based on the age of the participant.

There were also threats to internal validity. The students were in a virtual instruction condition, and circumstances around them while learning from their homes were unpredictable. It is difficult to assure that students were in fact participating appropriately in the intervention as the instructor had limited view of their working conditions in the virtual platform.

Although the administration of both pretest and posttest were designed to be one session, many students typically have multiple exposures to a text prior to post reading comprehension questions. During specialized instruction with this group of fourth grade students, the text passages are shared and reviewed multiple days before assessments are given. This was different than the pre and post assessment for this study and is a threat to validity. These students are typically guided through a passage and then asked to respond to post reading questions, and this study was set up without multiple exposures or any guidance through the passage. Furthermore, in this study there was no assessment of executive function skills. Consequently, it is not clear that executive skills were impacted by the intervention.

The tool used to measure the comprehension scores, the QRI5 used post reading explicit and implicit comprehension questions and did not measure all possible comprehension skills, and this is another threat to the external validity of this study.

Connections to Literature

The results of this study were that there was not a significant increase in post reading comprehension questions after a mindfulness intervention with a group of eight fourth grade students, who were all are receiving special education services and are identified as having ADHD. A similar study by Lux et al. (2020) was interested in improving the executive

functioning skills, including working memory, and students were provided in person, daily mindfulness intervention to encourage gains in the skills that make up executive functioning skills: working memory, inhibitory control and flexible thinking. The study compared emotional and behavioral regulations to support learning readiness in pre- and post-intervention activities. The Lux et al. study found success with a mindfulness intervention and “suggest that mindfulness-based practices can be implemented in developmentally appropriate ways with young children to positively influence aspects of EF and other skills associated with school success” (p 10). It is important to note that the Lux et al. study was done with a much larger population, six different schools in the Midwest, used trained mindfulness instructors, and ran for twelve weeks. These differences in study characteristics likely contributed to differing study results.

Implications to Further Research

Due to current restrictions on in person schooling because of the Covid 19 pandemic, this study occurred with students attending school in a virtual platform. Based upon the results of this study, future research may want to consider attempting a similar study when the students and teacher are in person. The factors that impact a learner when they are at home and participating virtually are too numerous to discount.

Future research should include additional interventions to improve working memory. A study done in 2011 by St. Claire-Thompson expanded on the struggles of a working memory deficit and the impact on young learners. The results show that “that teachers of children with a poor working memory need to adopt a multifaceted approach when attempting to alleviate the problems caused by working memory in the classroom” (p 413).

The participation group for this study was small and consisted of eight fourth grade students, 8 to 9 years old, who receive specialized instruction and are identified as having ADHD. Future studies may want to include a more heterogeneous group to determine the impacts of an intervention aimed to improve learning by providing an intervention to increase executive functioning skills.

This study did not show significant growth in post reading comprehension questions, and perhaps the length of the intervention was not enough to show growth. Variations in the intervention used and how it was administered also show cause for further research.

The research could also be expanded to include different types of texts and multiple modalities of student responses. Students could be provided alternate ways to show they have knowledge on a topic, especially in a post reading activity, supporting multiple modalities. Some students can express what they know in drawing a picture or providing an oral summary to share. Comprehension can be provided in a discussion with the students, asking them to provide more about a topic or a given response.

Any further research on this topic should also include the tracking of the on-task behaviors of students who are identified as ADHD. This could function as another tool when considering the implications of an intervention.

Summary

Although there was not a significant increase in post reading comprehension scores after a mindfulness intervention, observational data suggested there was some value to the intervention. By using a quick, easy, and inexpensive intervention, the hope is that executive functioning skills will be expanded in a positive way because of the positive experiences with the teacher that includes these interventions in their daily routine.

References

- Diamond, A., & Lee, K. (2011). Interventions shown to aid executive function development in children 4 to 12 years old. *Science*, 333(6045), 959–964.
<https://doi.org/10.1126/science.1204529>
- Dini, L. (2017). *Implementing an executive function online curriculum: A case study* (Order No. 10746057) [Dissertation, New Jersey City University]. Proquest Education Database.
- Esterhuizen, S. (2014). Improving some cognitive functions, specifically executive functions in grade R learners. *South African Journal of Childhood Education*, 4(1), 28.
<https://doi.org/10.4102/sajce.v4i1.181>
- Lubin, A., Regrin, E., Boulc'h, L., Pacton, S., & Lanoë, C. (2016). Executive functions differentially contribute to fourth graders' mathematics, reading, and spelling skills. *Journal of Cognitive Education and Psychology*, 15(3), 444-463.
doi: <http://dx.doi.org.goucher.idm.oclc.org/10.1891/1945-8959.15.3.444>
- Lux, C. J., Decker, K. B., & Nease, C. (2020). Supporting young children's executive function skills through mindfulness: implications for school counselors. *Journal of School Counseling*, 18(1).
- St. Clair-Thompson, H. L. (2011). Executive functions and working memory behaviours in children with a poor working memory. *Learning and Individual Differences*, 21(4), 409–414. <https://doi.org/10.1016/j.lindif.2011.02.008>
- Weiland, C. (2011). *Impacts of a prekindergarten program on children's cognitive, executive function, and emotional skills* (Order No. 3515908). Available from Education Database. (1027235765).

Willoughby, M. T., Magnus, B., Vernon-Feagans, L., & Blair, C. B. (2017). Developmental delays in executive function from 3 to 5 years of age predict kindergarten academic readiness. *Journal of Learning Disabilities, 50*(4), 359-372.

doi: <http://dx.doi.org.goucher.idm.oclc.org/10.1177/0022219415619754>

Zelazo, P., Blair, C., & Willoughby, M. (2016). *Executive Function: Implications for Education*.

National Center for Education Research; Institute for Education Sciences; U.S.

Department of Education.