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ACADEMIC MOTIVATION IN CHILDREN WITH ADHD

A MASTER'S THESIS
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BY
ELIZABETH A. BUTALA

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ACADEMIC MOTIVATION IN CHILDREN WITH ADHD

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APPROVED

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Abstract

Children with attention-deficit/hyperactivity disorder (ADHD) struggle academically and appear to have lower levels of academic motivation than their peers. This paper reviews the literature and evidence proving that lower academic motivation is associated with ADHD. The causes of the motivational deficits are both behavioral and explained by neurological differences in the brain. Research shows that children with ADHD lack the ability to inhibit their own reactionary behaviors and allow for executive functions to consider all the information available to make good decisions. In addition, children with ADHD have a strong preference for immediate rewards over waiting for long-term rewards. Behaviorally, students with ADHD have received negative feedback so often that they do not think they can be successful and therefore are not motivated to try. The biggest motivator of children with ADHD is to avoid failure which looks like work refusal and low motivation in the classroom. Research shows that academic motivation is best improved with behavioral therapy approaches and by using growth goals with students. Teachers help students with ADHD by providing consistent short-term rewards and immediate positive feedback. They should also find ways to increase the likelihood of success that students experience and remove or decrease the amount of failure experienced.

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CHAPTER 1: INTRODUCTION

Attention-Deficit/Hyperactive Disorder (ADHD) is the most common neurodevelopmental disorder among children today (Merrill et al., 2017; Thomas et al., 2015). Children with this disorder experience developmentally inappropriate levels of inattention, hyperactivity and impulse control. This results in deficits in academic, social, and behavioral skills that affect their societal, social, and academic well-being and performance from childhood and into adulthood (American Psychiatric Association, 2013). The impact of ADHD on academic performance can be severe. In elementary school, kids with ADHD may demonstrate severe academic difficulties demonstrated by lowered levels of work completion, work accuracy, on-task behaviors, and levels of homework completion (Merrill et al., 2017). This trend continues into middle and high school as students with ADHD have higher levels of truancy, lower homework completion, higher rates of suspension, lower grades, higher levels of school suspension, lower organizational skills, and lower graduation rates than their peers (Kent et al., 2011; Merrill et al., 2017; Molina et al., 2009). Since higher levels of education can lead to greater wealth, job satisfaction, health, and well-being, academic struggles for children with ADHD can negatively impact future life circumstances and have long-term emotional and psychological consequences for these children.

The United States Centers for Disease Control and Prevention first collected data on the prevalence of parent-reported ADHD in 1997 and since then the number of children reported to have been diagnosed with ADHD rose by approximately 3% each year until 2003 (Center for Disease Control and Prevention, 2013). Then, from 2003 to 2011, the number of children diagnosed with ADHD increased by 5% each year (Center for Disease Control and Prevention,

2017). By 2011, an estimated 11% of children had ever-diagnosed ADHD in the United States (Visser et al. 2014).

Diagnostic Criteria and Impairments

There are three types of ADHD: Predominantly Inattentive Type, Predominantly Hyperactive-Impulsive Type, and Combined Type (DSM-V; American Psychiatric Association, 2013). Each type varies slightly in the diagnostic criteria and symptoms. The Inattentive Type is characterized by difficulty sustaining attention, difficulty following-through on directions, difficulty organizing tasks and activities, easily distracted, and forgetful in daily activities. The Hyperactivity-Impulsivity Type is characterized by fidgeting or squirming, needing to leave a seat or classroom, running or climbing to a degree that is developmentally inappropriate, difficulty participating in leisurely or quiet activities, excessive talking, acting as if driven by motor, blurting out answers, difficulty waiting, and interrupting. The Combined Type has symptoms of both the Inattentive and Hyperactivity-Impulsivity Types. The DSM-5 Diagnostic Criteria for ADHD also requires that some hyperactive-impulsivity or inattentive symptoms are present before the age of 7, present in two or more settings, have significant impairments in social, academic, or occupational functioning, and the symptoms must not be better accounted for by another mental disorder (DSM-V; American Psychiatric Association, 2013). ADHD is usually first diagnosed in children, but one third of those children retain the diagnosis into adulthood which supports the idea of ADHD as a chronic condition (Barbarese, et a. 2013). Children with ADHD may forget or lose things, talk too much, squirm or fidget excessively, make careless mistakes, take unnecessary risks, have trouble taking turns, have difficulty in social interactions, and are often unable to resist temptations (Center for Disease Control and Prevention, 2013). While all children may demonstrate some of these behaviors at one time or

another, a key diagnostic criterion for children with ADHD is that they have these symptoms persistently and so severely that they cause difficulties with daily functioning, academic performance, and in social interactions.

Research Focus and Guiding Questions

From the perspective of a high school special education teacher, the difficulties that students with ADHD face in terms of academic performance are pervasive. The students with ADHD that I work with have alarmingly low homework completion rates compared to their general education peers. In addition, they complete less classwork, lose materials more frequently, and have lower attendance rates than their peers. These things are even true for students with ADHD and academic abilities in the average or even above average range. However, I noticed another pattern of behavior in the students with ADHD that is not mentioned in the DSM-5 diagnostic criteria. This characteristic was a total lack of motivation- not just on individual assignments or projects, but apathy towards grades, passing classes or even about graduating from high school. Neither peer pressure, rewards, praise, nor reasoning seemed to work to improve these students' motivation. As I tried to support these struggling students, I started to wonder- do the other symptoms of ADHD make academic tasks so difficult that it causes students with ADHD to lose motivation? Or is lower motivation itself a separate symptom of ADHD that is present even in the absence of other skill deficits? This experience led me to the guiding questions for my research. 1. How does ADHD affect academic motivation in children? 2. Is lower motivation caused other functional deficits or an isolated symptom of ADHD? 3. How can educators and parents best improve academic motivation levels in children with ADHD?

Motivation Research

In order to discover more about the influence of ADHD on academic motivation, it is helpful to first become familiar with motivational theory. Cook and Artino (2016) define motivation as “the process whereby goal-directed activities are instigated and sustained.” They use this definition to point out four key components of motivation: it is a process, it is focused on a goal, it requires both the initiation and the continuation of some action for the purpose of achieving a goal (Cook & Artino, 2016). While there are many different theories on human motivation, the research of Cook and Artino (2016) on theories of motivation identify four themes that occur in each of the major contemporary theories of motivation. The first theme is competency, or whether or not a person is able to do something. The second is the value placed on different outcomes. The third theme is attribution, or giving something/someone credit for an outcome, and finally all theories include cognition, meaning that motivation is impacted by someone’s thinking. In determining whether or not low motivation is caused by other deficits in people with ADHD or a separate isolated symptom, this literature review will use several of the major motivational theories as a lens through which to examine the relationship between ADHD and motivation. The first of these is the Expectancy-Value Theory which states that it is a combination of perception of ability and likelihood of success with the value placed on a task that influences motivation. The second is Self-Determination Theory which theorizes that autonomy, competence, and relatedness are all necessary in order to develop intrinsic motivation (Krapf, 2017). Finally, the Achievement Goal Theory will be used which breaks motivational behavior down into one of three goal types: mastery orientation, performance-approach, and performance-avoidance.

CHAPTER 2: LITERATURE REVIEW

Literature Search Procedures

The scholarly articles used in this thesis were found using searches in Academic Search Premier, PUBMED, ERIC, JSTOR, PsycINFO, PubMed, and Google Scholar. The key words used in these searches were “attention-deficit/hyperactivity disorder,” “motivation,” “academic motivation,” “ADHD,” “motivation theory,” and “ADHD treatment.” The structure of this chapter is to review the literature on the impact of ADHD on academic motivation, causes of low motivation in children with ADHD, and treatments.

ADHD and Academic Motivation

Neither the DSM-5 criteria or the description of ADHD from the Centers for Disease Control (CDC) mention low motivation as a sign, symptom or diagnostic criteria (DSM-IV; American Psychiatric Association, 2013; Centers for Disease Control and Prevention, 2013). However, academic research often includes deficits in motivation in the definition of, or as a characteristic of ADHD (Barkley, 1997; Dekkers et al., 2017; Gut, Heckmann, Meyer, Schmid, & Grob, 2012; Morsink et al., 2017; Torrente et al., 2011). Dekkers et al. (2017) states that “Children with attention-deficit/hyperactivity disorder (ADHD) are characterized by deficits in their executive functioning and motivation” (p. 1471). Coddington, Lewandowski, and Gordon (2001) state that research has found that “poor self-regulation of emotion and motivation” is one of the many cognitive characteristics of ADHD (p. 3). Similarly, Langberg et al. (2017) write that “accumulating evidence has suggests [*sic*] that deficits in motivation are a core underlying feature of attention-deficit/hyperactivity disorder (ADHD)” (p. 1).

Motivational Deficits in ADHD

In addition to becoming more common in descriptions of ADHD, there are also many studies that demonstrate and prove that deficits in academic motivation exist in students with ADHD. For example, A study by Volpe et al. (2006) measured the influence of different symptoms of ADHD along with several academic enablers on academic achievement in fourth-grade students with ADHD. They determined that ADHD negatively influences study skills and motivation. A different study by Gut et al., (2012) also concluded motivational deficits exist in children with ADHD. This study sought to examine the effect of academic motivation on academic performance in students with ADHD and two different control groups of students- the first included children with disruptive behavior disorders but no ADHD, and the second control group consisted of students without any known disorders. An adaptation of the Achievement Motivation Inventory (AMI) was used to measure children's achievement motivation in terms of their desire to achieve success and desire to avoid failure. Gut et al. found that students with ADHD scored lower than the children with disruptive behavior disorders and other control group in achievement motivation. The ADHD group had a lower desire for success and a greater desire to avoid failure than either of the other two control groups. Another study targeting levels of motivation specific to high school students also found that students in their first year of high school with ADHD were significantly less motivated when compared with state-wide data of all first-year high school students (Zendarski, Sciberras, Mensah, & Hiscock, 2017). Surprisingly, this same study found that there was no difference in levels of motivation between students with ADHD and their peers during their third year of high school. This may contradict other evidence that there is a correlation between ADHD and motivation, although the author theorizes that many students with ADHD may drop out of school between their first and third year of high

school and therefore are not reflected in the data. Torrente et al. (2011) adds to the research of motivation in their study of the levels of apathy in adolescents and adults with ADHD. Through patient interviews, interviews with relatives, and neuropsychological assessments, patients with ADHD (either inattentive or hyperactive-impulsive type) scored higher in all four measures of apathy than the control group. This deficit in motivation is consistent regardless of who is observing and rating the levels of motivation. This was shown in a study that used parent, teacher, and student self-ratings to report motivational styles and then compared the motivational styles and levels of children with and without ADHD. The researchers found lower levels of motivation in the parent, teacher, and student self-report in students with ADHD when compared to their typical peers (Carlson, Booth, Shin, & Canu, 2002).

Opposing research. Only one study in this review of literature did not show a significant difference in levels of motivation in students with ADHD and peers. Lee and Zentall (2012) studied reading motivational differences among different groups. 'Reading Motivation' for the purpose of this study was measured by self-efficacy, intrinsic motivation, extrinsic motivation, social reading motivation, and work avoidance through self-reported questionnaires. The study looked at children with a reading disability (RD), attention-deficit hyperactivity disorder (ADHD), both a reading disability and ADHD (RD+ADHD), and a typical comparison group. This study had surprising results. The students in the ADHD only category did not have any significant differences in levels of motivation from any other group, including the group without any disability. This was a different outcome from the far larger number of other studies that proved lower levels of academic motivation are associated with ADHD. These results may be explained by the fact that this study looked at motivation specific to only reading, or the reliance

on younger students to self-report, or it may provide important information about the need for further research on children with ADHD and comorbid disorders.

Despite this opposing study, the overwhelming majority of research shows that deficits in motivation are correlated with a diagnosis of ADHD. However, none of this research provides insight into the second guiding question which asks: why do these deficits exist?

Executive Functioning Theory

One of the earliest and most well-known researchers to make the connection between motivation and ADHD is a clinical psychologist and professor of psychiatry, Russell Barkley (Barkley, 1997). The causes and explanations of ADHD have changed through time, but Barkley proposed a theory which described ADHD as a disorder that causes impairments in the development of key executive functions which all connect to a core inability for inhibition (Barkley, 1997). In his executive functioning theory of ADHD, Barkley (1997) describes four main deficits: reconstruction, internalization of speech, working memory, and self-regulation of affect-motivation-arousal. Most useful to this research is his concept of self-regulation of motivation. Barkley (1997) defines the self-regulation of affect as the ability to control one's motivational states in order to accomplish a goal. In this theory, Barkley answers the second guiding question of this research that the ability to control and regulate one's own motivation is a core deficit of ADHD. This theory suggests that poor academic performance can at least partially be explained by a decreased ability to initiate and maintain the appropriate levels of motivation necessary to accomplish tasks. According to Smith and Langberg (2018), this theory is supported by neuroimaging which has shown delays in the prefrontal cortex development in patients with ADHD; an important part of the brain that helps regulate motivational states. Barkley (1997) explains that a key behavior necessary in working towards a goal is the ability to inhibit or stop

current responses. This allows for executive functions to take over like a conductor and direct behaviors away from the immediate towards longer term goals. McInerney and Kerns (2003) expand on Barkley's theory and state that "the central inhibitory deficit in ADHD essentially leads one to act immediately, rather than creating a delay in which one may 'think before one acts'" (p.92). Anyone who has experienced ADHD would agree that 'acting without thinking' is a common characteristic of the disorder. This would certainly help explain what appears to be a lack of motivation in kids with ADHD, but would also help explain some of the other consequences of ADHD including "higher rates of accidental injury, emergency room visits, peer problems, and academic failure" (Visser et al., 2014, p.34).

According to this theory, executive function in a typically-developed person is able to direct behavior away from the immediate and allow a person to work toward a longer-term goal even in the absence of immediate rewards or in the presence of unfavorable conditions such as boredom, frustration, or the loss of short-term rewards. However, the deficits in inhibition in ADHD do not give these executive functions a chance to influence behavior and as a result people with ADHD prefer short-term and immediate rewards even at the risk of larger negative consequences in the long term (Langberg et al., 2017). This is supported by brain imaging which has shown intensified connections between reward-motivation regions in the brain and decreased connections in areas of the brain related to control (Ma, van Duijvenvoorde & Scheres, 2016; Tomasi & Volkow, 2012).

Delay Aversion

Preference for an immediate or delayed gratification in ADHD is a widely studied topic. Numerous studies have shown that when given the choice between an immediate smaller reward and a larger delayed reward, children with ADHD show a significant preference for the

immediate smaller reward (Antrop et al., 2006; Luman et al., 2005; Sonuga-Barke et al., 1992; Sonuga-Barke et al., 2008; Solanto et al., 2001). Academic performance and motivation requires students to complete a never-ending series of tasks that many view as unfavorable or undesirable. For example, completing homework, studying, taking tests, self-discipline, struggling through difficult subjects, learning to read, etc. are seen by many as a means to an end. These are all completed in the pursuit of a greater long-term goal whether that be learning to read, earning a certain grade, or graduating from high school. A preference for immediate rewards and delay aversion could explain the lower levels of academic motivation in people with ADHD.

Barkley's Executive Functioning Theory of ADHD explains motivational deficits as an inability to inhibit immediate responses and allow executive functions to work towards a long-term or challenging goal. As a result, people with ADHD are motivated by immediate rewards and tend to act before they have time to consider all the information available to them before making a decision. This is seen by the impulsivity and tendency to 'act before they think.' Barkley would therefore argue that lower motivation towards long-term goals is itself a trait of ADHD and not a secondary symptom caused by learned behavior due to other skill deficits. If this theory provides a full explanation of dysfunctional motivation characteristic of ADHD, then researchers should be able to normalize abilities between people with ADHD and control groups by offering consistent and immediate rewards.

Normalizing Deficits through Motivation

The huge role that motivation plays in the lives of people with ADHD is evident in the number of studies that seek to understand the influence of enhanced motivational conditions on the performance of different cognitive tasks. These studies find conflicting results. For example,

Oosterlaan and Sergeant (1998) tested a hypothesis that response inhibition in children could be improved through enhanced levels of feedback and reward. They used a stop-signal task which requires the brain to quickly respond to stimuli and then inhibit that response when given a signal to stop. This task can be really challenging once the brain has already initiated a given response. This study found that even when children with ADHD were offered points that could be turned in for prizes, their level of response inhibition was still lower than that of a control group of children without ADHD who did not receive any reinforcement. A similar study was conducted by Slusarek, Velling, Bunk, and Eggers (2001) and had different results. This study also used a stop signal task to compare the response inhibition of children with ADHD to the response inhibition of two other control groups: one group of children with a different diagnosed disorder and another of kids without any type of psychological diagnosis. In the first trial, they tested the response inhibition of all three groups with a low-level incentive and found poorer response inhibition in the group with ADHD. However, in another trial where a higher incentive was offered, the level of response inhibition normalized between the three groups. Another very interesting study found that children with ADHD performed better at playing video games than watching television or performing another continuous performance task. However, their performance on the video game was still below that of a non-ADHD control group (McInerney & Kerns, 2003; Tannock, 1997) Here, even on a preferred and engaging activity, the performance of children with ADHD was lower than their peers indicating there is more than just motivation influencing people with this disorder.

Time Sense and Motivation

This same study inspired McInerney and Kerns (2003) to create their own study to test how motivation would impact the time sense of children with ADHD relative to a control group. In

this study, children were asked to complete a time reproduction task under normal and enhanced motivational conditions. Researchers hypothesized that the enhanced motivational version of the task would improve the performance for kids with ADHD, but not to the level of the control group without ADHD. The time reproduction task was a computerized game where children were shown images of a lightbulb. The image of the lightbulb remained on the screen for varying lengths of time. The children then tried to duplicate the amount of time the light bulb was on the screen by turning on and off their own lightbulb on the computer. In the regular version of this game, no feedback was given after each trial. An enhanced version of the light bulb game was created for this study intending to provide extra motivation. The enhanced version of the game was identical to the regular version but after each trial, an animated rhinoceros moved across the computer screen and provided a made-up score followed by positive verbal praise. This feedback was randomized and in no way related to their actual performance. In addition, during the enhanced version of the game, children were told if they reached a high enough score they could win a prize from a large, colorful and well-decorated box. They were also told if they did relatively well they could pick a prize from a smaller box covered in white paper. After playing each version of the lightbulb game, the participants were asked two questions about the game: “How much did you like the lightbulb game?” and “How much would you like to play the Light Bulb Game again?” (p. 96). The results of this study found that children with ADHD performed much better on the enhanced version of the light bulb game than the regular game. The control group of children showed no difference in performance between the two versions of the game. However, even on the enhanced light bulb game, the children with ADHD had poorer performance than the control group demonstrating cognitive deficits that could not be accounted for entirely by motivation.

Working Memory and Motivation

Dovis, Van der Oord, Wiers, and Prins (2012) also investigated the role of motivation on executive functions. Their study focused on motivation and working memory. The authors state that working memory is critical to study in the context of motivation because they had found conflicting research about the root cause of lower motivation. Some research suggested that impaired working memory is perceived as poor motivation because a child cannot remember and utilize information about what they are doing and what is necessary to reach a specific goal. Other research explained that children with ADHD have an abnormal response to reinforcement and therefore cannot activate and initiate the same level of effort on a task as typically developing children (Dovis et al., 2012). These opposing theories raised the question of whether or not children truly have deficiencies in executive functions such as working memory, or if they just need a greater level of reinforcement and reward to function at their full potential. To answer these questions, they designed a study which measured performance on a working memory task when offered different levels of reward and reinforcement. The results of their study found that when compared to a control group, children with ADHD performed worse on the working memory task even at the highest level of incentive. Another interesting finding of this study was about perseverance on the working memory task. The study found that in general the children with ADHD showed a decrease in performance over time but the control group did not. The strongest incentives were able to normalize the level of persistence of performance in children with ADHD relative to the control group. This suggests that deficits in working memory can be improved by increased motivation, but not entirely explained by motivational differences. Persistence and perseverance on a task, however, could be explained by motivational deficits. More research is needed to substantiate this idea.

Time on Task and Motivation

Difficulty sustaining attention is a typical symptom of ADHD. A study by Dekkers et al. (2017) questioned whether the difficulty sustaining attention is caused by deficits in executive functions or whether diminished or diminishing levels of motivation can be blamed. Dosis et al. (2012) hypothesized from their results that lower motivation may be partially to blame for decreased time-on-task in working memory in children with ADHD. Building on this research, Dekkers et al. (2017) explored if the time-on-task for response inhibition and attention in children with ADHD could be improved through motivation. This study used a stop-signal task which is similar to the go/no-go tests discussed in previous studies. A group of children with ADHD and a typically developed group of children (TD) each performed the stop-signal task twice. The first time, each group completed the task without any reinforcement as a measure of their response inhibition and attention. The second time participants completed the task, they were all randomly assigned to a group which received reinforcement or no reinforcement. It was predicted that the task performance of children with ADHD would be lower than the TD group in the first trial and in the second un-reinforced trial. It was also predicted that on the second trial of the task, the ADHD and TD group's performance would both be lower than in the first trial, although the difference between the two scores would be larger for the group with ADHD. Finally, the authors predicted that both groups would improve their scores during the second trial with the reinforcement and that the ADHD group would benefit more from the reinforcement than the TD group. The reinforcement during the second trial was the opportunity to earn coins which could be exchanged for a present if they earned enough. The children were shown the box of presents they could receive to further motivate them. The reinforcement group was shown how many coins they had earned after a set number of trials. The number of coins shown to this

group was 2, 5, 7, 9, or 10, in that order. Every student won the prize by earning 10 coins. Performance on this stop-signal task was measured by response inhibition, reaction time (RT), RT variability, and omission errors as measures of attention. On the first trial, the ADHD group had larger RT variability and made more omission errors than the TD group. These same results were found in the second task without reinforcement. Surprisingly, there was no difference in stop-start reaction time between the two groups. Overall, this showed that the longer time-on-task effects were shown in children with ADHD in basic attention when compared with the TD group. Reinforcement had a varying effect. RT variability appeared to be the only measure which was positively impacted by reinforcement in the group with ADHD, while the effects of reinforcement on all other measures did not differ between the group with ADHD and the TD group. These results demonstrated that the difficulty sustaining attention characteristic of children with ADHD can be partially, but not entirely, explained by a depletion in motivation.

Response Inhibition and Motivation

Another study that tried to untangle the relationship between motivation and executive function is the work by Desman, Petermann, and Hampel (2008). They focused on deficits in response inhibition of children with ADHD. Through their research, the authors found themselves asking a common question in ADHD research: is there evidence of an inherent executive deficit in response inhibition, or can this deficit be regularized by providing higher levels of reinforcement or motivation? To help answer this question they designed a study which measured the impact of five different reinforcement conditions (neutral, auditory feedback, reward, response cost, reward/response cost) on the behavioral and physical characteristics on a Go/No-Go task. If an inherent deficit in response inhibition exists, poorer response inhibition was expected under every reinforcement condition. If an inherent motivational deficit exists, the

performance on the response inhibition task in children with ADHD should match the performance of the control group under some reinforcement conditions. The Go/No-Go task was a computer program which required participants to press a key as fast as possible if they saw an “x” on the screen and refrain from pressing the key if they saw a “+” on the screen. The conditions surrounding this task included five variations meant to represent different forms and intensities of reinforcement. The first condition was Neutral (N) where no form of feedback was given. The second was Feedback (FB) in which correct responses resulted in a high sound, and errors triggered a deep sound. A Reward (R) condition produced a high-pitched sound and a five-cent reward for each correct response. The Response Cost (RC) condition started the children off with one euro. For each error, five cents were removed and resulted in a deep sound. In the final condition, Reward/Response Cost (R/RC) the children started with 50 cents. Each correct response resulted in an additional five cents and a high noise, while each incorrect response removed five cents and produced a deep noise. Task performance along with heart rate (HR) and skin conductance response (SCR) were measured for the control group and the children with ADHD. Results of this study showed that children with ADHD had lower response inhibition compared to the control group. The gap in performance between the two groups could not be removed in any of the five reinforcement conditions. Other studies have not always found an improvement in performance of the control group with additional reinforcement. However, this study found that both groups of children improved their task performance scores from the neutral condition in the auditory feedback, response cost, and reward/response cost conditions. The physiological variables of heart rate and skin conductance response reflected this change by both increasing from the neutral condition to some level of added feedback. However, there were no significant differences in how the two physiological measures increased between the ADHD and

control groups. The results of this study corroborate Barkley's (1997) theory that response inhibition is inherently deficient in children with ADHD. Motivation can improve this, but cannot normalize levels of inhibition with that of a group of non-ADHD peers.

The studies which attempted to untangle the complex relationship between motivation and other executive functions paint an even more multifaceted and symbiotic picture of how all the different functions of the brain work together. These studies showed that increasing motivation can have some success in improving other deficits associated with ADHD. Yet, manipulating motivation cannot entirely eliminate these deficits which proves that motivation cannot be the sole cause of the other deficits, unless the level of motivation offered in these studies were not enough.

Among the researchers that believe that motivational deficits are a core problem associated with ADHD (Haelein & Caul, 1987; Sergeant et al., 1999) there is yet another explanation for impaired motivation. As Dovis et al. (2012) explains, some researchers suggest that children with ADHD are less stimulated by reinforcement than their peers and as a result are not motivated to perform at the same level of a typically-developed child. In other words, ADHD causes abnormal reward sensitivity.

Reward Sensitivity

Reward sensitivity describes how an individual will respond to external influences of their environment such as rewards and punishments (Smith & Langberg, 2018). There is evidence that children with ADHD respond differently than their peers to external stimuli. For example, Olivier and Steenkamp (2004) argue that "Children with ADHD do not seem to internalise [*sic*] contingency systems as easily as non-ADHD children and therefore rewards must be greater and more intense to be effective" (p. 48). The idea of reward sensitivity also

appears in the dual pathway model of ADHD proposed by Sonuga-Barke (2003). This model describes two separate pathways which lead to the development of this disorder. One of the pathways involves disruptions in reward processing (including reward sensitivity) and the other involves executive dysfunctions. Disruptions in one or both of these pathways can lead to ADHD (Sonuga-Barke, 2003; Tenenbaum et al., 2018). To test reward sensitivity, many studies have compared the impact of reinforcement on a task in children with ADHD to the impact of reinforcement on the same task in children without ADHD. Dovis, Van der Oord, Wiers, and Prins (2012) looked at studies that met this criteria and found that only half of these studies determined an abnormal response to reinforcement in children with ADHD. The other half reported that students with ADHD did not respond differently to reinforcement than their typically-developed peers. These results may seem to indicate that ADHD does cause a difference in sensitivity to reward or reinforcement, but as Dovis et al. (2012) explain, the differences in these results could be explained by the difference in form and amount of reinforcement used in each study. If children with ADHD require different levels of reinforcement than their peers, then these studies are not a helpful measure of reward sensitivity. If the threshold where reinforcement influences behavior in children with ADHD is much higher than the threshold for their peers, it could be that the reinforcement in studies showing no difference in reward sensitivity had reached that threshold, while the studies that showed a discrepancy between the two groups did not. Dovis et al. (2012) increased the complexity of studying reward sensitivity by suggesting that it is not only the intensity of a reward that may impact children with ADHD differently, but also the type of reinforcement. Dovis et al. (2012) therefore designed a study to clarify some of this complexity and examine the effect of different intensity and forms of reinforcement in task performance in children with ADHD. The authors

state, “We compared the performance of children with- and without ADHD on a visual-spatial WM (working memory) task in four reinforcement conditions: Feedback only, feedback and a small monetary incentive (1 euro), feedback and a large monetary incentive (10 euros), and a computer game version of the task” (Dovis et al., p.671). They made four predictions. First, they hypothesized that children with ADHD would perform worse in the Feedback-only version on the WM task than the control group (without ADHD). The second and third predictions were that the difference in performance between the ADHD and control group would decrease in both incentive conditions and that there would be no difference in performance in the high-incentive (10 euro) version. Finally, they predicted that the mean WM performance would improve in all incentive conditions, but only the computer game condition would help improve the perseverance of the group of children with ADHD (Dovis et al., 2012). To test their hypothesis the researchers recruited 30 children with a diagnosis of ADHD and 31 control children with no diagnosis of ADHD. Each child participated in two 60-minute test sessions one week apart. In each session, two of the four reinforcement conditions were randomly applied. The working memory task involved a multi-colored chess board which would light up specific squares. After watching a sequence on the chess board, the child had to reproduce the sequence by clicking on the squares of the chess board. The difficulty of the sequences was adaptive to each individual student’s performance and as a result the ratio of positive to negative feedback was approximately the same for every child in every reinforcement scenario. In the feedback-only condition of the trial, the children were told to do the best they could and respond accurately. The program produced visual and auditory feedback after each response, indicating if it was correct or incorrect. In the incentive condition, the children were told they could earn euros (1 or 10) if they did well enough on the task. The euro coins they could earn were placed in sight during the

task. They were told the computer randomly decided how many correct responses were required to win the money and how many incorrect responses would cause the child to lose. In the computer-game version of the WM task, the basic task was the same but with added elements of a typical video game. In the game, the participants had to use their robot to save the world and destroying enemy robots, earn rewards, and protect their character from damage. The game also included extra animations, levels, story-lines and competitions. As the child progressed through the game, their character improved rank and received upgrades. The researchers compared the overall mean performance of each task, and also divided each task into early, middle, and later performance to help compare performance over time. The findings showed that the ADHD group did poorer on the WM task than the control group at every condition of the task. Both levels of incentive and the computer game all significantly improved the mean performance for those with ADHD but interestingly neither the incentives or the computer game significantly improved mean performance for the control group. This suggests that feedback alone was enough reinforcement for the control group to reach their peak performance level, but the children with ADHD required higher levels of reinforcements to improve their performance (Dovis et al., 2012). This study supports the theory that there may be differences in reward sensitivity for people with ADHD. More specifically it indicates the presence of a higher reward threshold.

Heart Rate and Reward Sensitivity

There are physiological and biological differences which also point toward an atypical reward sensitivity in children with ADHD. The first of these is a difference in the dopamine system of the mid-brain (Krapf, 2017). There is evidence that a difference exists in the dopamine pathways in children with ADHD which changes the way they respond to rewards (Krapf, 2017). In addition to dopamine pathways, research in this area has found that children with ADHD have

lower heart rate responses to feedback than children without ADHD (Crone, Jennings, & Van der Molen, 2003). Tenenbaum et al. (2018) confirmed the disruption of internal reward sensitivity in children with ADHD in their study of the parasympathetic and sympathetic nervous systems. In this study, 69 children with ADHD were compared with 48 typically developing children. All children participated in a task which was designed to measure their willingness to take risks while balancing the opportunity for reward and loss. The study also measured their sympathetic reward sensitivity and parasympathetic regulation with cardiac pre-ejection periods (PEP) and respiratory sinus arrhythmia (RSA). The children with ADHD demonstrated lengthened PEP which indicated reduced internal reward stimulation. The authors concluded that ADHD is associated with disruptions in rewards sensitivity and regulatory processes. These findings support some type of dysfunctional response to feedback.

Luman et al. (2007) took this same physiobiological approach to studying reward sensitivity. In their study, they used heart rate responses following feedback and heart rate variability to measure mental effort in kids with and without ADHD. Both of these measures are sensitive to how someone processes feedback. Luman et al. (2007) found children with ADHD had smaller heart rate responses to feedback compared to the control groups. They concluded that children with ADHD do have some type of abnormality in their processing of feedback. The heart rate responses measured in this research are also sensitive to the difference between expected and actual feedback. Using this information, researchers discovered that children with ADHD demonstrated abnormal performance expectations for themselves. Namely, the participants with ADHD had much lower expectations for themselves than the control group. This unintended finding opens up an entirely different set of theories and evidence which may help explain the motivational deficits characteristic of ADHD.

The link between lower motivation and children with ADHD is clear. The neurological and biological reasons why are as complex as the concept of motivation itself.

As the study by Lumen et al. (2007) found, children with ADHD have lower expectations for their own success than children without ADHD. This discovery leads one to wonder- beyond the complex neurological and biological causes of lower motivation and responses to reinforcement- are there behavioral and psychological reasons that may help explain the motivational discrepancies in children with ADHD? Morsink et al. (2017) attempted to answer this question in one of the first qualitative studies of the attitudes of children and adolescents with ADHD toward intrinsic and extrinsic motivation.

Qualitative Analysis of ADHD Motivation

Morsink et al. (2017) conducted interviews with children and adolescents between 9 and 16 years old with and without ADHD. Each interview lasted around 40 minutes and was structured around five core questions to help participants describe what motivates them in their everyday life. The researchers reviewed the data from the interviews and then used software to help code the responses by general characteristics. Then, themes were developed from the responses and cross-checked to ensure they were representative of the participants' original meaning. The motivational themes were mostly similar across the ADHD and non-ADHD groups. The responses showed that both groups valued and were motivated by a sense of togetherness, feelings of pride, need for variation, and the effects of physical activity. Some people valued social reinforcement, others valued material reinforcement, and for others the journey itself was more important than the destination or reward. Although the vast majority of responses were similar between groups, there were some distinct differences between participants with and without ADHD.

The first difference is that children and adolescents with ADHD had a clear aversion to slow passing of time, which was not present in the group without ADHD. Participants with ADHD wanted things to go fast, and hated experiencing the feeling of time moving slowly. Similarly, needing to invest time to reach a goal was undesirable for those with ADHD. Second, while both groups expressed a desire for variety, only the group without ADHD mentioned valuing things that were familiar and predictable. The enjoyment of familiarity was not present anywhere in the responses of children and adolescents with ADHD. Finally, the “sense of togetherness” which was a value mentioned frequently in both groups was described differently in the group without ADHD. The group without ADHD valued the opportunity to be themselves and be affectionate. The group with ADHD did not mention either of these things. In the interviews, the two groups of participants were also asked to describe motivation. Both groups described motivation in general terms, citing external and internal motivation equally as often. An equal distribution of kids between both groups had trouble describing motivation.

It is surprising how similar the responses were between the two groups. However, as the authors note, “these overall qualitative similarities do not necessarily imply that a similar preferences hierarchy is in operation for the two groups...youngsters with ADHD might still be motivated by these factors to different degrees- which were not examined in this analysis” (Morsink et al., 2017, p.928). These results also provide some corroborating evidence to support some of the earlier discussed theories. Most pointedly, the negative connotation that participants had with the passing of time correlates strongly with the delay aversion theory of ADHD. The absence of any appreciation of familiarity and predictable activities in children with ADHD suggests that the often-repetitive tasks used to measure the abilities of various executive functions in children with ADHD are inherently less enjoyable to children with ADHD. This

suggests an alternative explanation for the lower performance of children with ADHD on many of the repetitive tasks used in studies on ADHD. Finally, this study provides some evidence to suggest that children with ADHD may value social relationships in a different way than children without ADHD. The authors summarize their research by stating that individuals with ADHD may not only have different motivational drives, but also may be impacted by additional difficulties in pursuing their goals (Morsink et al., 2017).

Self-Determination Theory

According to many theories of motivation, the challenges that children with ADHD face when trying to pursue goals are detrimental to their ability to cultivate appropriate levels of motivation. One such theory is the Self-Determination Theory which helps describe how people can reach their full motivational potential. This theory suggests that there are three psychological needs that must be fulfilled for healthy development. They are autonomy- control over one's own behavior, competence- the feeling that one is able to accomplish something, and finally relatedness- the feeling of being connected to and cared for by others (Krapf, 2017). These three needs are essential to healthy development but also prerequisites to developing intrinsic motivation. Self-Determination Theory also states that people are born with a high level of intrinsic motivation but if the three essential needs are not met and if they experience repetitive failures, a child loses their intrinsic motivation and relies more heavily on extrinsic motivation (Lee & Zentall, 2012). Research by Carlson, Booth, Shin, and Canu (2002) which studied the motivation styles of children with and without ADHD using self-reports, teacher, and parent reports determined that children with ADHD were "more likely to gauge their level of performance based on external feedback than on their own internal standards" (p. 110).

Based on the characteristics and symptoms of ADHD, it is reasonable to assume that one or all three psychological needs described in Self-Determination Theory are not easily met in children with ADHD. Their impulsivity (autonomy), poor academic performance (competence), and impaired social relationships (relatedness) prevent a child with this disorder from developing intrinsic motivation. This was the hypothesis of recent research on the development of intrinsic motivation in children with ADHD.

Intrinsic Motivation and ADHD

Krapf (2017) was intrigued by the Self-Determination Theory and predicted that children with ADHD have poorly developed intrinsic motivation. This researcher also wondered if behavioral interventions and use of external rewards and consequences or medication caused children to associate their behavior as something out of their control, further diminishing their feelings of autonomy and decreasing their ability to develop intrinsic motivation. The Children's Academic Intrinsic Motivation Inventory (CAIMI) was used to measure intrinsic motivation in the areas of reading, math, social studies, science, and also produced an overall measure of intrinsic academic motivation. The results of this study were surprising. There were no significant differences in self-reported intrinsic motivation levels in children with ADHD when compared to their peers. Within the group of participants with ADHD, there was also no difference in the level of intrinsic motivation based on type of treatment the children had received- providing no support for the prediction that external rewards, consequences, medication, or therapy may have a negative effect on intrinsic motivation. This may disprove the Self-Determination Theory's explanation of intrinsic motivation, but there are a few limitations of this study which must be considered. First, the study had a relatively small sample size. Additionally, the study only included students between the ages of 9 and 11. Since the Self-

Determination Theory states that the deterioration of intrinsic motivation happens over time, it may be that the participants in this study were too young to have their intrinsic motivation impacted.

Achievement Goal Theory

Another motivational theory which is highly applicable to children with ADHD is the Achievement Goal Theory. This theory suggests three different ways that people pursue a goal. The first is Mastery Orientation. This approach is driven by a genuine desire to learn and master material. The second is Performance Approach, wherein an individual works towards an external goal or wants to be compared favorably to others. The final way is Performance-Avoidance. In this approach, one is driven by the desire to not look bad (Smith & Langberg, 2018). In terms of the impact on academic performance, Mastery Orientation is viewed the most favorably and will help one persevere through challenges. If people are motivated by the Performance-Avoidance approach, they are at the highest risk of using artificial strategies and avoiding challenges in pursuit of their goals. The Performance-Avoidance approach produces the lowest academic outcomes of the three approaches. Young people with ADHD are the least likely to have a Mastery Approach and are most likely to take a Performance-Avoidance approach because they have a tendency to avoid challenging tasks, give up easily, and become more frustrated than their typical peers (Smith & Langberg, 2018). Carlson et al. (2002) found evidence to support this theory in their research which discovered significantly lower scores on self-reported levels of intrinsic motivation, preference for challenge, curiosity, and internal criteria for success in children ages 9-12 with ADHD when compared to peers in the same age group without ADHD. Similar results were discovered by Beike and Zentall (2012) who used the Teacher Rating of Academic Achievement Motivation (TRAAM) to compare children 6-11 years old with and

without ADHD. This research found that children with ADHD avoided challenge more, had lower achievement motivation, and lower mastery levels when compared to the control group of typically developed children. An interesting South African study took a close look at the motivational needs of children with ADHD and compared them to the nature of achievement motivation in children without ADHD (Olivier & Steenkamp, 2004). These researchers thought this information was the most helpful in developing educational and therapeutic strategies for children with ADHD to improve their motivation. For the purpose of this study, the researchers broke the variables affecting motivation into four parts: the motive to achieve, a positive fear of failure, negative fear of failure, and the motive to portray socially acceptable behavior. The study included 43 students with ADHD and 255 non-ADHD students. The measuring instrument was the *Prestatie Motivatie Test voor Kinderen (PMT-K 83)* which is a self-assessment questionnaire that is designed to measure the four variables of motivation. This study showed that the group with ADHD was motivated mostly to avoid failure rather than to achieve success. It appeared that boys with ADHD in particular became easily frustrated by tasks and would more readily quit when faced with failure. The ADHD group also scored significantly lower than the non-ADHD group regarding the desire to demonstrate socially acceptable behavior (Olivier & Steenkamp, 2004).

The Achievement Goal Theory of motivation suggests that the way children with ADHD approach goals may explain why they do not appear to have the same level of academic motivation as children without ADHD. If children are not approaching goals with a mastery orientation and instead are just trying to avoid failure, they will not develop the same level of perseverance and tenacity in the face of challenges. A mastery orientation requires students to experience some failure and discomfort in pursuit of mastering a goal. Without the ability to

sustain attention, effort, and time it requires to learn and master something new, children with ADHD will have a difficult time developing this approach to motivation.

Expectancy Value Theory of Motivation

The final theory of motivation which is often used in literature to help explain motivational deficits in children with ADHD is the Expectancy Value Theory. In this theory, the motivation towards a task is a combination of how a person perceives their own ability and the likelihood of their success and the value they place on the activity (Smith & Langberg, 2018). A key component in this theory is previous experience with success and failure. Repetitive experiences of failure and frustration can lower self-esteem and create negative beliefs about one's abilities. Negative coping strategies are developed as a result such as procrastination or avoidance to help prevent future feelings of failure (Torrente et al. 2011). Prior negative experiences can lead to negative thoughts which become a self-fulfilling prophecy. In the study by Olivier and Steenkamp (2004) which found that avoiding failure was the leading motivational factor in children with ADHD, the researchers theorized that this was because of these students experience with so many previous failures. Langberg et al. (2017) wondered if this theory would apply to children with ADHD's beliefs and motivation to complete homework.

Homework completion is an area that children with ADHD really struggle with. It requires organization, can be repetitive and time-consuming, and doesn't give immediate satisfaction. The expectancy value theory of motivation has been used to assess the homework completion of children without ADHD. In this study, it was found that the relationship between beliefs about homework and homework completion varied in typical children based on subject matter. Homework completion was also found to be heavily influenced by family and classroom level factors (Langberg et al., 2017). To build on this research, Langberg et al. (2017) used this

theory of motivation to study homework completion specifically in children with ADHD. For this study, information on homework behaviors were collected from teachers, parents, and as a percentage of total assignments completed. After analyzing the data, researchers found that the expectancy value theory of motivation is statistically significant on the homework performance of children with ADHD. Also, how students with ADHD view their own abilities and likelihood of success matters more than the value they place on that task (Langberg et al., 2017).

Motivational Interventions

There are various methods used to treat the symptoms of ADHD. Literature and researched was reviewed to establish what, if any, impact the various treatments had on academic motivation.

Medication

One of the most common treatments for ADHD is medication. In 2011, 69% of children diagnosed with ADHD took an ADHD medication. At that time, this number was estimated to be about 3.5 million, or 6.1% of all children in America (Visser et al., 2011). Stimulants continue to be the most common and well-known type of medication used to treat the symptoms of ADHD. These medications are fast-acting and are effective in reducing the symptoms of ADHD for 70-80% of children (Center for Disease Control and Prevention, 2013). Research shows that stimulant medications also help improve motivation in children with ADHD. A study by Chelonis et al. (2011) examined the effects of one type of stimulant medication (methylphenidate) on a progressive ratio (PR) task. Progressive ratio tasks are often used to measure motivation in both human and non-human subjects. They measure motivation by requiring responses in order to earn reinforcements while the number of responses necessary to earn the reinforcement gradually increases. In this particular study, children could earn nickels

by pressing a lever. The number of presses necessary to earn nickel increased by ten after each reinforcement. The children who participated in this study all had a diagnosis of ADHD. They completed the PR task twice- once while on medication and once without medication. When the children were on the medication they had a higher break point, or higher ratio of task to reward, that they were willing to complete. While on medication children also had a lower interresponse time, but the medication did not impact the post-reinforcement pause duration. This study determines that stimulant medication increases motivation to continue an on-going task but has little to no effect on the initiation of that task (Chelonis et al., 2011). Another study on the effect of methylphenidate on an inhibition control task also concluded that the medication was effective in increasing motivation levels of children with ADHD close to the motivational levels seen in typically developing children (Liddle et al., 2011).

However, studies that evaluated the influence of medication on something more practical and requires motivation to perform a functional task, such as completing homework have had different results. A study by Merrill et al. (2017) evaluated the effect of stimulant medication, behavioral treatment, and a combination of stimulant medication and behavioral treatment on the homework performance of children with ADHD. The behavioral treatment in this study included homework-specific parent training programs and a daily report card between teachers and families. The results showed the behavioral treatment improved homework completion and accuracy. The medication only produced small and clinically insignificant improvements on homework performance, and the combined behavioral and medication treatment did not produce any higher levels of homework completion or accuracy beyond what was found in the behavioral treatment group alone (Merrill et al. (2017). These results suggested that there is no benefit of

stimulant medication alone beyond effective parenting and behavior interventions. Other research corroborates the benefit of behavior therapy for children with ADHD.

Behavior Therapy

The American Academy of Pediatrics (2011) states that behavior therapy is a crucial part of a treatment plan for children with ADHD. Behavior therapy is used to encourage certain behaviors while discouraging less desirable behaviors. While children are still very young this type of therapy is often offered to parents or families in addition to providing individual support to children with ADHD. Despite the importance of this type of intervention, Visser et al. (2011) found that in 2011, only 51.1% of children with ADHD had received treatment or counseling from a mental health provider.

Behavioral parent training. The study on homework performance by Merrill et al. (2017) found that the parent behavioral training significantly improved the homework performance in children with ADHD, even when compared to the use of stimulant medications. Another study that tested the effect of behavioral parent training in families of children with ADHD found that this type of therapy led to “significantly greater improvement in parenting behavior, parenting sense of competence, child functional impairment, parental stress, and parental depressive symptoms compared to families of children with ADHD who did not receive the therapy treatments (Chacko & Scavenius, 2018). This study did not find any positive effects of behavioral parent training on specific ADHD symptoms such as attention, concentration, hyperactivity, or impulsivity. It is important to note, however, that these symptoms of ADHD only become negative traits when they interfere with a child’s ability to function in various settings. So, if behavioral parent training improves the functioning of a child both in school and

as a member of a happier family, many would argue that it accomplishes the true goal of the intervention.

Growth-Based Approaches

Under the umbrella of behavior therapy approaches, the role of a growth mindset and using personal best goals has shown promising results in improving the academic motivation and achievement of children with ADHD. ‘Personal best’ or PB goals are created to help students focus on their own personal growth and achievement instead of comparing their level to other students (Martin, 2013). This seems to be a promising model based on the influence of “fear of failure” has on students with ADHD. Personal growth or personal best goals aim for and celebrate small improvements. As a result, students do not have to reach the achievement level of other students in order to be successful. Research has shown that even when motivational differences are normalized, children with ADHD still have deficits that will make it challenging for them to reach the same level of achievement as typical peers- another reason why growth-based goals are well suited to children with ADHD. In 2012, this model was put to the test in a study of the relationship between the use of personal best goals and academic achievement, motivation, and engagement (Martin, 2012). In this study of more than 3,400 Australian high school students with and without ADHD, personal best goals improved achievement, homework completion, planning and persistence in children with ADHD. This study also showed lower levels of disengagement with the use of personal best goals. In many cases, personal best goals had a greater impact and showed bigger levels of improvement in students with ADHD than in those without ADHD. Personal best goals work because they provide very specific information about what a child needs to improve on. They also are effective in creating realistic goals that are both challenging and attainable. For example, it may be unrealistic for a student who currently

has a D-average to try to earn all A's. Motivational theories state that students would view this goal without much belief that it is attainable and therefore would not have motivation to pursue it. However, a smaller and personal best goal of improving grades from a D to a C would be viewed as attainable and therefore improve motivation in children with ADHD. As students reach small goals, they see their likelihood of success to improve which increases their sense of autonomy and self-confidence. It appears this type of intervention is effective because it addresses many of the psychological factors that negatively affect motivation for children with ADHD identified in the various theories of motivation examined.

Physical Fitness

Although not officially recognized as an evidence-based treatment for ADHD, a lot is known about the positive effects of physical exercise on the brain (Berwid & Halperin, 2012). The impact of physical fitness on motivation in children with ADHD is less widely researched and understood. There are a limited number of small studies which found exercise interventions to improve executive functioning, increased response speed, improvements in impulsivity, disruptive behaviors, sustained auditory attention, visual search speed, and improved parent ratings of social, thought, and attention problems (Berwin & Halperin, 2012; Gapin & Etnier, 2010; Medina et al., 2010; Chang et al., 2012; Verret et al., 2012). However, none of these can be used to infer how physical fitness would impact academic motivation. There is one study that specifically explored the impact of exercise on the mood and motivation in young men with ADHD. Fritz and O'Connor (2016) tested whether a 20-minute burst of exercise on a stationary bike would increase sustained attention, reduce hyperactivity, and improve mood and motivation in un-medicated young men with ADHD. The results found that the exercise improved motivation for mental work, increased feelings of energy, and reduced feelings of fatigue,

confusion, and depression. This study found no effect on cognitive performance or hyperactivity (Fritz & O'Connor, 2016). In summary, there appears to be some preliminary research to indicate some improvement of motivation due to exercise in people with ADHD. However, since exercise is beneficial to all people, much more research is needed to identify whether it has any motivational benefits specific to children with ADHD.

CHAPTER III: DISCUSSION AND SUMMARY

Summary of Literature

ADHD has become the most commonly diagnosed neurological disorder in children today and its prevalence continues to grow (Merrill et al., 2017; Thomas et al., 2015). By definition, this disorder impacts functioning skills in multiple settings such as at home and at school (American Psychiatric Association, 2013). Research has shown that children with ADHD demonstrate lower levels of academic motivation and higher levels of apathy towards school (Barkley, 1997; Dekkers et al., 2017; Gut, Heckmann, Meyer, Schmid, and Grob, 2012; Morsink et al., 2017; Torrente et al., 2011). Unfortunately, this has serious long-term consequences which include higher rates of unemployment, delinquency, substance abuse, mental health problems, and school drop-out rates (Henry et al., 2012; Zendarski et al., 2017). Therefore, understanding the relationship between academic motivation and ADHD is critical in order to improve outcomes and interventions.

Although the link between lower academic motivation and ADHD is clear, the reasoning behind the connection is not. Barkley's (1997) theory of ADHD would explain lower academic motivation as an inability to inhibit behaviors and allow for the more productive executive functions of the brain to take over and direct behavior towards a long-term goal. This explanation is also supported by neurological imaging (Smith & Langberg, 2018). In Barkley's theory, children without the ability to inhibit behaviors, due to ADHD, act impulsively and always pursue immediate gratification. In terms of academic motivation in children with ADHD, this can look like preferring to play with friends instead of doing homework, or being on social media in class instead of taking notes. The preference of immediate rewards and an aversion to

delay is well documented in research (Antrop et al., 2006; Kuntsi et al., 2001; Luman et al., 2005; Solanto et al., 2001; Sonuga-Barke et al., 1992; Sonuga-Barke et al., 2008).

Despite the preference for immediate reward and disinclination of deferred reinforcement, research has not shown that deficits in children with ADHD can be attributed to poor motivation alone. Many studies have examined the impact improved motivation has on various other executive functions. These studies have had inconsistent outcomes. One study on response inhibition in children with ADHD found that even when offered external rewards for performing well on a stop-start task, children with ADHD's inhibition control was still lower than that of typically developing peers (Oosterlaan & Stergeant, 1998). However, other studies on inhibition control have recorded performance levels in children with ADHD equal to that of their peers if a high enough incentive is provided (Slusarek et al., 2001). Nevertheless, even on the most engaging and motivating of activities (playing video games), research has shown deficits still exist in children with ADHD (Tannock, 1997; McInerney & Kerns, 2003). In a study measuring the ability to accurately reproduce amounts of time using a computer game, an enhanced version of the game improved scores in children with ADHD, but not enough to equate with the levels demonstrated by a control group without ADHD (McInerney & Kerns, 2003). Similar results followed from a study on the role of motivation and working memory in children with ADHD. In this study, children with and without ADHD performed a working memory task and were offered different levels of rewards and reinforcement. This study showed that even the highest level of incentive could not normalize the working memory between children with and without ADHD. However, this study did find that higher incentives improved the persistence of performance in children with ADHD to the level of their non-ADHD peers (Dovis et al., 2012). One study attempted to differentiate between diminishing executive function and diminishing

motivation to explain the deficits in sustained attention in children with ADHD. Researchers attempted to counteract any depletion in motivation by providing extra reinforcement. As a result, the extra reinforcement helped to improve one indicator of attention, but did not significantly improve sustained attention (Dekkers et al., 2017). Overall, the majority of research indicates that providing higher levels of external motivation can help children with ADHD improve their performance in other cognitive areas, but it cannot completely normalize the gaps between them and their peers.

It is very challenging to compare research on motivation because the studies often use different levels or forms of reinforcement and test children doing many different types of tasks. Some researchers explain the different outcomes in motivational studies on the fact that children with ADHD may have a dysfunctional sensitivity to rewards. It may not be merely the presence of a reinforcement, but the intensity of reinforcement that matters for children with ADHD. However, research on reward sensitivity also has mixed results with roughly half of studies finding an abnormal response to reinforcement when compared to children without ADHD and the other half finding no difference in response (Dovis et al., 2012).

Motivational theory is another helpful tool to examine why children with ADHD demonstrate lower levels of motivation. The Self-Determination, Achievement Goal, and Expectancy Value Theories of Motivation all point to common factors that are specific to ADHD and may determine levels of academic motivation. The past experiences of repetitive failure have a negative effect on academic motivation. Previous failure and negative feedback decreases their own sense of competency, causes them to approach goals with the mindset of just wanting to avoid failing, and also decreases the motivation for a task because they do not perceive a high

probability for success (Krapf, 2017; Carlson et al., 2002; Smith & Langberg, 2018; Olivier & Steenkamp, 2004).

The two types of evidence-based treatments for ADHD are medication and behavioral therapy. While there is a lot of research available about the effects of these two different treatments on the symptoms of ADHD. Research specific to academic motivation is limited. Medication is effective in treating the symptoms of ADHD for 70-80% of children (Center for Disease Control and Prevention, 2013). Research shows that stimulant medication can increase motivation and focus for longer periods of time on isolated tasks, but research is not conclusive on the ability for medication to improve motivation to initiate tasks (Chelonis et al., 2011; Liddle et al., 2011). However, no improvement was shown in a study on the impact of medication on homework performance (Merrill et al., 2017). This study found that behavioral therapy improved levels of homework performance in children with ADHD. Research also supports the use of growth-goals to increase motivation in children with ADHD (Martin, 2013). The use of growth goals addresses the pervasive fear of failure, feelings of incompetence, and expectations for failure that research shows is found in children with ADHD and that motivational theory explains may be responsible for lower levels of academic motivation (Carlson et al., 2002; Krapf, 2017; Martin, 2013; Olivier & Steenkamp, 2004; Smith & Langberg, 2018).

Limitations of the Research

There is a huge amount of research available on ADHD and motivation. However, since motivation is such a complex concept, it was challenging to narrow the literature down to that which specifically helped answer the guiding questions in my thesis. Motivation is a difficult thing to research because it is difficult to measure. It is hard to differentiate whether an improvement or change in academic performance can be attributed to higher motivation to

complete the task, or an improvement in another function. The guiding question that I set for this thesis, about whether deficits in motivation generally or deficits in different other skills are responsible for the lower levels of motivation, was a question that several researchers included as something that could not be fully understood from their studies. While attempting to interpret results about motivation specific to ADHD, it became necessary to understand more about basic motivational theory. The number of different theories, causes, and influences on motivation was so large that number of theories used for the purpose of this research was limited to the theories that appeared most often in the research related specifically to academic motivation in ADHD. There are countless other theories of motivation which could not be included for the purpose of this study. The same is true for ADHD interventions and treatments. There was a vast amount of literature available on treatments for ADHD, but few that included research specific to the impact of motivation. For this reason, many other types of treatment for ADHD could not be included in this literature review.

Implications for Future Research

There are so many unknowns and variables regarding motivation. It may be impossible to fully understand what causes the different levels of motivation in people, or what is responsible for the lower levels of academic motivation seen in people with ADHD. Even as technology improves and helps researchers discover more about the brain and motivation, the same advances in technology impact and will change how children are motivated. There is a lot of research available about the effects of motivation on specific executive functions of the brain in children with ADHD. However, as an educator, I personally hope to see this field of research become more specific to identifying which interventions can best improve academic motivation in children with ADHD. My recommendation for future research would be to study and explore the

implementation of various interventions for children with ADHD in schools with the goal of providing more tools for teachers and parents. Despite 69% of children with ADHD being treated with medication and a little over half of children receiving behavioral therapy, the prognosis for kids with ADHD is not good. The number of children who are receiving behavioral treatment is very low and this kind of treatment is not accessible to everyone. As a result, it will become more and more critical for special education and general education teachers to understand not only how they can help children with ADHD learn, but how to engage them in school and motivate them. This is especially true considering the growing number of children diagnosed with ADHD every year.

Implications for Professional Application

If educators are to serve the large and growing population of students with ADHD, they must recognize that academic motivational deficits exist in children with ADHD. Whether it is an inherit trait caused by neurological dysfunction, a result of years of failure and negative feedback, or a combination of both, children with ADHD cannot be expected to reach the same level of academic motivation as their peers without intervention.

Further, educators must also understand that even the highest levels and forms of reinforcement to increase motivation may not entirely make up for the differences in some of the other deficits in executive functions such as working memory impulse control, sustained attention, etc. As a result, they can neither ignore deficits in motivation for this population, nor can they entirely rely on motivational interventions and ignore addressing other skills. Teachers can also learn a lot about working with children with ADHD from studying motivational theory. In the communities that they create in their classroom, all children should experience autonomy, competence, and relatedness. Teachers must be aware and look for signs that children have

mastery goal orientation and are not going through the motions of school just to avoid failure. The ratio of positive to negative feedback for all children, but especially those with ADHD, must always include more positive feedback, or else students will learn to avoid negative feedback in any way possible. It is also helpful when designing lessons, setting goals, or even just asking a child to complete something, that the motivation put towards that task will be a combination of the perception of how likely that student is to be successful and how much value they place on the task. Unrealistic and too ambitious of goals will not help children with ADHD succeed. One technique educators can use is setting growth-based and personal best goals for students with ADHD to allow them to experience success and increase the perception that the goal is achievable. Educators should also take into account that students with ADHD prefer and value novelty, variety, and a fast pace more than their typical peers. In a classroom, doing the same type of activity every day may bring comfort and routine to one student may completely frustrate and disengage a child with ADHD. Teachers of children with ADHD should always seek out new ways to incorporate variety, novelty, games, and limit the amount of time spent on overly repetitive tasks.

It is also important for teachers to be educated about different forms of treatment, even though teachers and educators are not typically a decision-maker in this area. It's important to know that while medication may help individual symptoms of ADHD, it may not be effective on the more comprehensive academic functions such as completing homework or keeping materials organized. One of the biggest areas for improvement in the treatment of ADHD is the use of behavioral therapy for the individual and the family. Teachers can help encourage families to seek this kind of support and can also seek out professional development and training on behavioral therapy techniques for working with students with ADHD and their families.

Research indicates that the best outcomes for motivation and performance come when the entire family and school team is involved. However, this kind of specialized treatment is not available to all kids and may not always be pursued by families. Therefore, educators may be the only source of this critical kind of treatment, but far too many teachers do not have the skills and knowledge to provide this kind of support to children with ADHD. As the most common childhood disorder in America, special education and general education teachers need more training and development to help them also understand ADHD and the best behavioral and academic interventions and supports. This is not only critical to the success of the individual child, but may improve entire communities by lowering incarceration rates, emergency room visits, and unemployment.

Conclusion

ADHD and academic motivation are both incredibly complex and difficult to understand. It is clear from research that ADHD does correlate with lower levels of academic motivation in children. It appears that several things may account for the lower levels of motivation. ADHD causes changes in the brain that affect executive functions and how children work toward long-term goals and respond to reinforcement. In addition to these differences in the brain, the experiences of previous and sometimes repetitive failure in children with ADHD can also impact the motivation of this demographic of children. Educators and parents can help improve the motivation in children with ADHD by providing extra external motivators, create lessons and activities in class that include novelty, immediate reinforcement, and limit the amount of time spent on repetitive tasks. Teachers and parents can also help by limiting the amount of failure and negative feedback that children with ADHD experience. They can help children with ADHD pursue a more successful approach to academic goals by using growth goals. Finally, behavioral

therapy for both the child and the parents should be treated as the first and most important intervention for children with ADHD and should continue throughout their schooling.

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