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Non-Pharmacological Behavioral Interventions for ADHD in the Elementary School Classroom

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Abstract

Attention deficit hyperactivity disorder (ADHD) is manifest in 5% of children and 2.5% of adults. Because diagnosis requires symptoms be present before age twelve, ADHD will be treated in the classroom. This review assesses the effectiveness of non-pharmacological treatments for ADHD in the elementary classroom in addressing students' inattentive/distractible, hyperactive and impulsive behavior, and idiosyncratic interventions addressing all core symptoms. Research demonstrates that Computer Attention Training, Computer Assisted Instruction, self-monitoring, and decreasing distraction using white noise were significantly effective in reducing inattentive/distractible behavior. Additionally, stability balls, physical activity, activity schedules, and mindfulness training were effective in some studies. Idiosyncratic interventions – daily report cards and function-based interventions – improved classroom functioning overall. Limitations of the literature include inconsistent operationalization, isolation of variables, consideration of long-term effects, and dosage of treatment. Observer effect and small *n*-sizes were also common limitations. Future research is needed regarding the effects of weighted vests, praise, teaching techniques, and animal-assisted interventions. An examination of the literature shows that although some expensive, harder-to-implement interventions are successful, many inexpensive and easy-to-implement interventions are just as effective. More research in the effectiveness and ease of implementation of these interventions would benefit all who work with students with ADHD.

Keywords: Attention Deficit Hyperactivity Disorder, non-pharmacological, behavioral intervention, elementary school, classroom

Non-Pharmacological Behavioral Interventions for ADHD in the Elementary School Classroom

Attention deficit hyperactivity disorder (ADHD) is one of the most common disorders found in children. The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) defines ADHD as “a persistent pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development, as characterized by [inattention symptoms] and/or [hyperactivity and impulsivity symptoms]” (Krull, 2017; American Psychiatric Association, 2013, p. 59). According to the DSM-5 (American Psychiatric Association, 2013), ADHD is prevalent in 5% of children and 2.5% of adults and is more common in males than females; however, other sources argue varying percentages (from 2-18% of children and 8-11% of school-aged children, with an increase in diagnosis recently) depending on year, population measured, and diagnostic criteria (Safer, 2018; Krull, 2017). Additionally, while the disorder is more common in males than females, the inattentive-type (as opposed to the hyperactive-type) is more common in females among those diagnosed (Krull, 2017). Regardless of type, however, ADHD affects one’s ability to function.

ADHD symptoms make many aspects of life more challenging for those with the disorder starting from early childhood, especially as many of their skill deficits affect their ability to perform academically (Liu, 2017). Children with ADHD may struggle with low self-esteem, academic failure, and rejection from peers (Harpin, 2005). This occurs specifically as the child enters elementary school and other children begin to learn socially acceptable classroom behavior and notice the non-conforming behavior of the child with ADHD (Harpin, 2005). The hyperactivity associated with ADHD tends to diminish once the child reaches adolescence; however, adolescents that continue to experience hyperactivity associated with ADHD may also experience academic failure as well as high rates of dropping out, teen pregnancy, and driving

accidents (Harpin, 2005). Finally, adults with ADHD experience higher rates of dismissal from work due to things such as tardiness, failure to complete tasks in a timely manner, and excessive errors, as well as an increase in various types of accidents, especially driving accidents (Harpin, 2005; Bukstein, 2018; American Psychiatric Association, 2013).

While ADHD symptoms have a large impact on a patient's everyday life throughout the various stages of life, ADHD presents the largest problem, from a societal standpoint especially, in the classroom setting (Bukstein, 2018; Harpin, 2005). This may be due to the symptoms both interfering with the child's ability to learn and disrupting teachers and peers (Harpin, 2005). Because the ADHD diagnosis requires diagnostic criteria to be present before the age of twelve, this disorder will have its most evident effects and highest opportunity for treatment in the classroom (American Psychiatric Association, 2013).

One of the primary treatments proposed for both school-aged children and others with ADHD is pharmacological therapy, often in conjunction with non-pharmacological therapies (Solanto, 2017; Krull, 2018a). Pharmacological treatment consists primarily of stimulant medication, which is the preferred medication due to how fast it takes effect along with its history of efficacy and safety; as such, stimulants have been found to be more effective than a placebo in treating the core symptoms of ADHD (Krull, 2018b). However, potential side effects of these drugs include "anorexia, insomnia, and tics," in addition to priapism in rare cases, all of which can diminish with proper dose regulation (Krull, 2018b). Some of these symptoms tend to be minimal and somewhat avoidable with proper management (The MTA Cooperative Group, 1999). It is worth noting that combination treatments (behavioral/psychological and pharmacological) have been found to be just as effective in treating ADHD as medication alone and it is possible that combination treatment could result in lower medication dosages (Krull,

2018a; The MTA Cooperative Group, 1999). With the existing potential side effects, it is worth investigating how much of the benefit comes from non-pharmacological treatments alone and how much medication is truly necessary.

Non-pharmacological treatments or behavioral interventions have also been shown to be effective in treating symptoms of ADHD, though they have not been shown to reduce the core symptoms of ADHD on their own and their long-term effects have not yet been determined (Krull, 2018b). Behavioral interventions are often the first line of defense and while many studies show that non-pharmacological treatments are preferred by parents, more research is necessary to determine the efficacy of these treatments, as several studies show that medication is preferred (Krull, 2018a; Schatz et al., 2015; Charach, Skyba, Cook, & Antle, 2006). Overall, combination treatment has been shown to be more effective than behavioral/psychological treatments alone and no more effective than medication alone, though it appears the combination treatment may result in a reduction of medication dosage as well as problem behaviors unassociated with ADHD (Krull, 2018a). It has been suggested that in cases of combination treatment, beginning with behavioral treatment and adding pharmacological treatment second may be more effective for school functioning and other outcome measures (classroom rule violations, teacher/parent ratings, out-of-class disciplinary actions, etc.) for elementary students than beginning with pharmacological treatment and adding behavioral treatment second (Pelham et al., 2016). While there have been many studies conducted on pharmacological and combination treatments, there are fewer that have examined non-pharmacological treatments alone, which would be necessary to evaluate their effectiveness.

This review will examine past research to assess the effectiveness of non-pharmacological behavioral interventions for ADHD in the elementary classroom (K-6).

Specifically, it will review interventions addressing inattention/distractibility, interventions addressing hyperactivity and impulsivity, and interventions that target all core-symptoms at once. The implications of these interventions in the classroom setting, limitations of current research, and suggestions for future research will also be discussed.

Method

To find related literature, I searched the EBSCO's PsychINFO database for (attention deficit hyperactivity disorder) AND (treatment OR intervention OR management) AND (classroom). Limiting the publishing year to 2008 and later, this search resulted in 324 academic journal articles, dissertations, books, and electronic resources. Once I limited the search to academic journals, books, and electronic resources, only 270 results remained. After sorting through the article titles, abstracts, introductions, and discussions to only include relevant research in the English language, I had a total of 108 results. I further narrowed the literature by removing outdated books (defined as being published 2015 or earlier) and only maintaining articles that focused on elementary school students' behavior as altered by interventions that could be readily implemented in the classroom. This left 24 articles and book sections to be reviewed. I obtained the articles through the access provided by Brigham Young University.

Results

Inattention/Distractibility Behavioral Interventions

The main concern for students with inattention/distractibility in the classroom is their ability to stay on task during expected and appropriate times in order to complete their work. This symptom of ADHD is manifest in off-task behavior, the symptom most often addressed by teachers in the classroom.

One attempted approach in classroom interventions for ADHD's inattentive symptoms has been the development of attentional skills. Rabiner, Murray, Skinner, and Malone (2010) conducted a study on the effectiveness of two computer-based interventions – Computer Attention Training (CAT) and Computer Assisted Instruction (CAI) – in training the attention of 77 inattentive first-grade students. The CAT focuses on training the students to incrementally increase the amount of sustained attention they can give. CAI, on the other hand, focuses on providing frequent feedback to children with attentional difficulties aimed at improving their academic achievement. Between the baseline measurement and immediately after the intervention, students' attention problems had fallen nearly a full standard deviation and continued improvement was evident by their follow-up testing the next fall. Other studies have also found CAI to be an effective way to more fully engage students with ADHD in the learning process and give them opportunities to be more successful through regular feedback; though, other cognitive training computer programs have had mixed effects and further research is needed to confirm and/or differentiate these results in the classroom setting (Schultz, Storer, Watabe, Sadler, & Evans, 2011; Dilawari & Tripathi, 2014; Evans, Owens, Wymbs, & Ray, 2018). With more research, these studies may support the idea that students with ADHD benefit from frequent feedback through computer-assisted learning programs and that these programs may help ADHD students train attention skills on their own.

Additionally, inattention has been addressed through self-monitoring, in which students are taught to observe their behavior and record it in order to improve the behavior (Alsalamah, 2017). Self-monitoring with videotapes has been studied for over four decades and has been found effective in a variety of subjects, variables, and externalizing disorders (Madaus & Ruberto, 2012). Further, it was found effective for students with ADHD in three separate studies

conducted in the 1990s (Madaus & Ruberto, 2012). A more recent study by Rafferty, Arroyo, Ginnane, and Wilczynski (2011) addressed self-monitoring in the context of studying spelling words and found a dramatic improvement of on-task behavior for all three fifth-grade students diagnosed with ADHD. During the baseline phase of this study, the mean percentage of on-task behavior was 47% for Student One, 52% for Student Two, and 38% for Student Three; those levels increased to 85%, 88%, and 80% after the intervention, respectively (Rafferty, Arroyo, Ginnane, & Wilczynski, 2011). Within this study, self-monitoring was done by prompted self-evaluation via a tone delivered at random increments through headphones, prompting the child to ask himself/herself “Am I on task?”. They responded by marking a tally in one of two categories on a *t*-chart labeled “yes” and “no.” The most telling part of this study was that during self-monitoring conditions, two of the three children diagnosed with ADHD produced on-task scores comparable to their non-ADHD diagnosed comparison peers. These studies may indicate that when students with ADHD are aware of what they are doing, they could be likely to be more attentive; however, more studies with larger sample sizes would be needed in order to demonstrate this phenomenon more generally. Because of its demonstrated effectiveness in other arenas, however, this would be an extremely viable line of investigation.

Decreasing distraction for those with ADHD has been another technique employed in the literature on interventions for students with ADHD. One study examined the effect of this distraction reduction strategy by using white noise administered through noise-cancelling headphones to an ADHD-diagnosed student (Cook, Johnson, & Bradley-Johnson, 2015). The participant was a seven-year-old, African-American first-grader who had combined-type ADHD (that is, a combination of hyperactive and inattentive symptoms) (Cook et al., 2015; American Psychiatric Association, 2013). When the student listened to white noise through headphones,

his off-task behavior decreased and his assignment production increased. The student began taking stimulant medication part-way through the study; however, there were three phases of the study conducted before he began taking the medication in which they could examine the effectiveness of the white noise independently. These phases were as follows: baseline, without headphones or white noise; headphones without white noise; and headphones with white noise. The percentage of reduced off-task behavior was at its highest when the student had headphones with white noise, followed by the baseline condition (no headphones or white noise), with the least amount of off-task behavior being reduced when the student had headphones without white noise. This finding raises several possibilities, first, that ADHD students may benefit from low noise distraction environments and second, that the distraction-eliminating strategy may need to be absolute – that is, fully blocking out the distraction, not just masking it. Additionally, while the methods of this study are unique, these results show that there are multiple methods that should be further explored in decreasing inattention in students with ADHD. Further studies with larger, randomized samples would also be needed with these types of distraction decreasing strategies in order to more fully understand their impact on ADHD symptoms, as this study alone cannot be adequately generalized. That being said, this would appear to be a promising field of research as decreasing distractions around those who are easily distracted would logically decrease inattention and distractibility.

Other studies also demonstrated effective techniques to increase on-task behavior and decrease inattention and distractibility. One intervention found that the use of stability balls increased attention of 100% of the eight fourth and fifth-grade students involved (Fedewa & Erwin, 2011). Prior to the intervention, on average, the children were on task 10% of the time and in their seats 45% of the time. During the intervention in which the stability balls were used,

however, the children were on-task nearly 80% of the time and seated on their balls 94% of the time. With a sample size as small as this, further replication is needed, however, with the large increase seen in these eight children, stability balls' effectiveness with ADHD children warrant further study. Additionally, in a review of the literature on the effects of physical activity on childhood developmental disorders, Pontifex, Fine, da Cruz, Parks, and Smith (2014) discussed that physical activity has been shown to increase attentiveness in the classroom in addition to contributing positively to other cognitive functioning. These effects are seen when either single bouts of physical activity or chronic physical activity are employed, though more research is needed to examine the degree of difference between these two "dosages." A study conducted using activity schedules – a series of visual cues (words or pictures) that guide a child through a series of tasks or a task step-by-step – found that, after two boys (ages 7 and 9) were trained in the use of the activity schedules, their on-task levels reached or came within six percentage points of 100% while completing their assignment (Cirelli, Sidener, Reeve, & Reeve, 2016). This was an increase of between 38% and 46% from baseline phases (Cirelli, Sidener, Reeve, & Reeve, 2016). Finally, mindfulness training, in which students are trained to pay particular attention to the present moment, has been somewhat effective in decreasing off-task behavior in the classroom, though results vary and more research is necessary (Carboni, Roach, & Fredrick, 2013). From these studies, it would seem that when children with ADHD are engaged in physical activity and more aware of their actions (specifically when they are distracted and misbehaving), those behaviors often decrease.

Hyperactivity and Impulsivity Behavioral Interventions

While they are separate core symptoms of ADHD, manifestations of hyperactivity and impulsivity are difficult to differentiate in a child's classroom behaviors. Hyperactivity describes

a child's unusually elevated level of activity and is described in the DSM-5 as ADHD students being frequently "on the go" (American Psychiatric Association, 2013, p. 60). Students with ADHD will often exhibit symptoms of hyperactivity, not necessarily due to a lack of attentional ability but because they require a higher level of stimulation (Simon, 2016). Impulsivity, on the other hand, describes the level of disinhibition that involves acting without prior planning or thinking about possible consequences (American Psychiatric Association, 2013). Both of these symptoms are often manifest in disruptive or off-task behavior such as calling out, getting up out of one's seat, inappropriate engagement with teachers or peers, etc.

Another solution for decreasing hyperactivity is to meet the need for stimulation through physical activity. In the stability ball study mentioned earlier conducted by Fedewa and Erwin (2011), using stability balls instead of chairs reduced scores on the Attention Deficit Hyperactivity Disorder Test (ADHDT) on average for all of the children but significantly so for the children with ADHD. The ADHDT is a 36-item questionnaire that was completed by the students' teachers two weeks before and two weeks after the intervention. The time the students with ADHD spent in their seats also increased significantly when using the stability balls. Additionally, Pontifex et al.'s (2014) review, which assesses the effects of physical activity on childhood brain health, mentions several studies that found a decreased level of hyperactivity after a single bout of, or breaks including, physical activity. They include a study with one four-year-old boy having regular access to the playground and another study with twenty-five boys engaging in thirty minutes of intensive aerobic exercise (Pontifex et al., 2014). This review also mentions the benefit that long-term physical activity has been found to have in treating ADHD symptoms overall, though more research is needed. These studies show that physical activity

may be of some benefit to students with hyperactive-type ADHD; however, inconsistent results found in other studies also demonstrate the need for more research (Evans et al., 2018).

In addition to being helpful with inattention, self-management has also been shown to decrease levels of hyperactivity and impulsivity. Self-evaluation, another type of self-management intervention, is when the child is taught not only to monitor their own behavior but to assess it and match their assessment against either a teacher or peer assessment (Terenzi, Ervin, & Hoff, 2010). Terenzi et al. (2010) conducted a study on the effectiveness of class-wide self-management of rule-following on the disruptive/off-task behavior of sixth-grade students with ADHD. The experiment implemented a self-management intervention in conjunction with a schoolwide intervention that focused on these rules: Be safe, be responsible, and be respectful. Terenzi et al. (2010) assessed student engagement levels across four phases: baseline, typical classroom procedures with occasional gold-slips; gold-slips, teacher distributed high amounts of gold-slips for rule-following (this was the schoolwide token system); class-wide self-management, student evaluated both individual and collective class behavior in five minute intervals; and self-management fading, student evaluated both individual and collective class behavior in seven-minute intervals. Engagement levels were the lowest for all three students during the baseline phase both when it was initially introduced and when conditions reverted back to that phase after other phases were implemented. Levels of engagement significantly improved during the gold slip phase and somewhat during the class-wide self-management phase, though scores were the highest and most stable during the self-management fading phase. The authors also found that when the conditions changed back from a gold-slip or class-wide management level phase to the baseline phase, levels of engagement were barely discernable from pre-intervention conditions. The success of the study, while necessarily taken cautiously as

it is a case study, demonstrates the possible effectiveness of both reinforcement and self-management in addressing off-task behavior. Therefore, this research may support the idea that being more self-aware helps these students' levels of disinhibition decrease, leading to a decrease in both hyperactive and impulsive behavior.

Interventions Addressing All Core-Symptoms

There are a few main types of interventions that address all core-symptoms of ADHD; however, they will vary in appearance and exact composition depending on the specific needs of the child (Reddy, Newman, & Verdesco, 2015). Many children may not respond as well to class-wide interventions as to individualized plans. These types of highly personalized interventions are defined as idiosyncratic interventions (Schultz et al., 2011). While some interventions can be implemented to address specific core symptoms, many of the proposed interventions are designed to address problem behaviors and deficits as a whole. These types of interventions, while based on some sort of evidence-based template, are highly idiosyncratic and customized to the specific student making generalizability difficult. In this literature review, these idiosyncratic interventions consisted of daily report cards and function-based interventions.

A daily report card (also known as a daily behavior report card, DRC, or DBRC) is a basic means by which teachers can evaluate the student's behavior in the classroom and communicate the behavioral level at which the student is performing to the parent. There is no universal template for these report cards; it is simply a means of communication between the student's teacher and guardian. It has been suggested that DRCs are among the most effective interventions for students with ADHD because they are less expensive (and therefore educational institutions are more likely to implement them), they tend to lessen conflict between teachers and parents (by increasing regular communication), and they provide regular feedback for the child

(Moore, Whittaker, & Ford, 2016; Fabiano et al., 2010; Schultz et al., 2011; Owens et al., 2012).

While DRCs include home communication, this literature review will cover strictly the classroom side of the intervention and does not include studies showing the effectiveness of parent involvement.

Daily report cards have been found to improve classroom functioning, personalized goal attainment, and academic productivity and decrease disruptive behavior when compared to the business as usual groups and controls (Fabiano et al., 2010). With that being the case, ADHD students did not reach the level of normal functioning as rated by their teachers which suggests more rigorous interventions may be necessary (Murray, Rabiner, Schulte, & Newitt, 2008). This positive effect is not unique to a specific gender, age, or race and is found to be most effective within the first month of implementation with a steady improvement in behavior over the course of four months, though success should be evaluated monthly and discontinued if deterioration is present in the second month (Owens et al., 2012). This data supports the effectiveness of DRCs with the general population and somewhat with the ADHD population; however, more research needs to be done to find ways to increase its effectiveness with ADHD students specifically.

Function-based interventions, interventions that are based on what the student aims to achieve with their behavior (attention, escape/avoidance), are another viable idiosyncratic intervention for students with ADHD. Cho and Blair (2017) assessed one multicomponent function-based intervention conducted with two sixth-grade students. Each student's intervention included the following components: (a) a schedule board and activity sequence charts that provided better predictability for the students, (b) a five-minute warning before switching from a preferred activity to a non-preferred activity, (c) interspersing preferred and non-preferred activities, and (d) providing seating arrangements. This intervention effectively improved

academic engagement over a four-week period for both students involved. Student One's problem behavior decreased in frequency from 3.4 times during the baseline to .54 times during the intervention. Similarly, Student Two's problem behavior decreased in frequency from 4.6 times during the baseline to .25 times during the intervention. The effects were fairly stable across the four-week intervention and across academic subject (writing, math, and reading). Cho and Blair (2017) also mentioned that the changes were both "immediate and profound" (p. 234). While the long-term effects of this intervention were not assessed, this provides evidence that the short-term effects of a function-based intervention can be seen just as quickly as the effects of pharmacological interventions, possibly without long-term side effects.

Another function-based intervention evaluated the effectiveness of a reinforcement schedule in the classroom that was based on the function to either escape or receive attention. This intervention not only showed a decrease in disruptive behavior for a first-grade student but a continued decrease even after Adderall was discontinued (Skinner, Veerkamp, Kamps, & Andra, 2009). This point regarding Adderall may provide some evidence as to the possibility that non-pharmacological interventions might be just as, if not more, viable than pharmacological treatments, however this must be further researched as this finding is not consistent across the board. The study also provides the possibility that teachers and peers have the ability to be involved in the intervention with little researcher training. A final case study conducted with a fourth-grade student found that self-monitoring in combination with regular teacher attention was effective in improving behavior (Waller, Albertini, & Waller, 2011). These studies seem to demonstrate that children with ADHD may benefit from holistic and personalized classroom interventions, though more thorough research is needed with larger, randomized samples.

Interventions with Potential

While the specific field of classroom-based interventions for ADHD student behavior is quite limited, there has been a plethora of research done regarding ADHD interventions that warrant future research in their classroom application. One study was conducted in Taiwan on the effects of weighted vests on improving attention, on-task behavior, and impulse control in 110 children diagnosed with ADHD (Lin, Lee, Chang & Hong, 2014). While there was no significant improvement in impulse control, there was improvement in inattention, on-task behavior, and other areas; however, the study was conducted in a lab setting and would need to be conducted in a classroom setting to truly assess its effectiveness on classroom behavior. Another study found “tootling” – the classic “tattling” but instead of bad behavior, children report prosocial behavior – effective in decreasing disruptive behavior in the classroom overall when in conjunction with a classroom contingency program (Cihak, Kirk, & Boon, 2009). While the study included children with ADHD and found a decrease in poor behavior overall, only two students in the classroom had been diagnosed with ADHD and one of them was one of six students who were consistently responsible for a large portion of the disruptive behavior. Though praise, from both teachers and peers, is often employed with children with ADHD and found to be effective, more research is necessary in this area with a more intense focus on its effectiveness with students with ADHD in the classroom setting (Reddy et al., 2015; Schultz et al., 2011).

There have also been studies conducted about the nature of ADHD and how those with the disorder learn better. Imeraj et al. (2013) evaluated the effects of different teaching styles on students with and without ADHD found that students with ADHD decreased in on-task behavior during whole-class group teaching and individual work but improved during activities that involved less demand for self-regulation, motivation, and information processing. Finally,

animal-assisted interventions, specifically canine interventions in after-school programs, have been found effective in reducing stress, increasing cognitive arousal to optimum levels, and enhancing social skills for ADHD students; however, more research into its application, effectiveness, and feasibility in the classroom setting is necessary (Fine & Schuck, 2017). As their application to ADHD is limited and under researched, these interventions and strategies would benefit from further investigation.

Discussion

Students with ADHD not only benefit from frequent feedback, but findings also indicate that attention can be trained in these students as well. Additionally, when children with ADHD are more aware of when they are distracted and misbehaving, those behaviors often decrease, and the students tend to be more attentive. Being more self-aware also decreases these students' levels of disinhibition, leading to a diminution of hyperactive and impulsive behavior. Furthermore, unique intervention implementation and methodology demonstrate that there are multiple methods that should be further explored in decreasing all symptoms and problem behaviors experienced by students with ADHD. The literature also suggests that physical activity may lower hyperactive behavior, though more research with consistent findings is necessary. Finally, idiosyncratic interventions are effective for ADHD students as they incorporate a holistic and personalized approach. For example, daily behavior report cards have a positive effect on problem behavior overall; however, more research needs to be done (in this and other areas) to find ways to increase its effectiveness with ADHD students specifically.

Current research on interventions for ADHD students provides a good foundation of both specific types of interventions that are effective for students with ADHD, as well as more broad interventions for students overall; however, there are several gaps and limitations in current

findings. First, comparison of studies' effectiveness is difficult. Constructs, such as the ADHD diagnosis and "off-task" or "on-task," are operationalized and coded differently across studies. In future research, it would be beneficial for researchers to abide by a standard operationalization of such terms; different definitions and practical applications can result in a large variation of results. Second, studies failed to isolate variables, which can negatively affect findings. In future research, it would be necessary to assure the experimental groups have discrete characteristics, such as including children diagnosed solely with ADHD, taking specific sub-type identification into account, and mandating a strict discontinuance of medication (as some studies do not take into account which students are on medication and which are not) (Carboni et al., 2013). This will allow the effects of individual variables to be better evaluated. Third, there is the constant concern of the observer effect and not knowing whether children improve their behavior when they know that they are being observed (Carboni et al., 2013).

Fourth, there is a lack of examination of the negative effects of non-pharmacological treatments. As addressed by Antshel and Barkley (2008), those conducting research on non-pharmacological treatments of ADHD often do not consider the negative effects that they might inflict just as experimental medications would. In accordance with the perspective of the medical model, intensity or "dosage" of various non-pharmacological treatments are rarely, if ever, investigated or addressed in the current literature, though its effects are seen upon study comparison (Pelham & Fabiano, 2008). Similarly, the fifth limitation is the current lack of follow-up in subsequent years following interventions (Evans et al., 2018). This does not allow for assessment of effectiveness; immediately effective interventions will benefit the current classroom and teacher. The goal, however, of interventions with ADHD students is to establish life-long coping skills that lead the children to success both now and in the future. Finally, while

ADHD is common, due to its small prevalence in comparison to the general population, many of the studies conducted in the literature are either case studies or have a small number of participants – many not exceeding 60. Future researchers would do well to conduct large-scale experiments to establish stronger reliability and validity.

In addition to the aforementioned limitations, other interventions that were previously mentioned warrant further investigation. These interventions have the potential to provide benefits for students with ADHD; however, as their effectiveness for students with ADHD was not directly or thoroughly evaluated, more research is necessary (Lin et al., 2014; Cihak, Kirk, & Boon, 2009; Reddy et al., 2015; Imeraj et al., 2013; Fine & Schuck, 2017).

ADHD affects both the children with the disorder and the teachers' ability to teach effectively in the classroom. With more research into effective behavioral interventions, children with ADHD will have more opportunity to succeed in the classroom as their learning and arousal needs are met more adequately. In turn, the teachers will also benefit from the research; being trained in more effective interventions will help them feel more in control of the classroom. This research will benefit teachers as they see the advantages of simple interventions such as stability balls or self-monitoring and begin to implement them into their classroom routines. While students with ADHD are presently guaranteed access to disability benefits in school, both past and future research and developments should be applied to give ADHD students the unique help they need instead of grouping them together with all other children with disabilities. Using the research to form these types of programs will not only benefit the teachers and the children in their present classroom setting, but it will allow them to develop key coping skills that can lead them to success as they learn to adapt to life's challenges.

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