

Efficacy of Meditation as an Intervention for ADHD - A Critical Review of Qualitative and Quantitative Studies

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Abstract:

Attention-Deficit / Hyperactivity Disorder (ADHD) is a neurobiological disorder commonly prevalent in children that persists into adulthood. Though Pharmacotherapy has been the first line of treatment for ADHD, the side effects and inability to tolerate medication has led many parents and children with ADHD to try complementary and alternative medicines (CAM). Among the various CAM modalities, yoga and Meditation or mindfulness have been tried out and used due to the lack of side effects, easy accessibility, and cost-effectiveness. This article attempts to systematically review the qualitative and quantitative literature available on the efficacy of Meditation as an intervention for children with ADHD.

1. Introduction:

Meditation is an ancient Indian practice that originated over three thousand years ago. It has a prominent role in the ritual practice of major religions and is also an effective therapy for many physical and mental health problems. (Barrows & Jacobs, 2002; Krisanaprakornkit et al., 2010).

Attention-Deficit/Hyperactivity Disorder (ADHD) is a complex and heterogeneous neurodevelopmental

childhood disorder. It is characterized by the three core symptoms of inattention, hyperactivity, and impulsivity (American Psychiatric Association, 2013).

First-line therapy for ADHD is pharmacologic management with a stimulant. Some patients experience severe side effects or no response to stimulant medications (O'Neill, 2021). Such patients predominantly go for complementary and alternate therapies. The efficacy of meditation-based

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interventions for ADHD has been increasingly investigated over the past few years as a possible therapeutic complementary treatment option for ADHD.

2. ADHD Definition and Prevalence:

Attention-Deficit/Hyperactivity Disorder (ADHD) is a complex and heterogeneous neurodevelopmental disorder. It is typically characterized by age-inappropriate levels of inattention, hyperactivity, impulsivity, or both (American Psychiatric Association, 2013).

ADHD has a worldwide prevalence of 3.4% among school children (Polanczyk et al., 2015). The studies in India show an ADHD prevalence rate of 11.32% among primary school children (Venkata & Panicker, 2013) and 6% among 10 to 15-year-olds (Bansal & Barman, 2011).

3. Characteristics of ADHD:

Typically, children with ADHD have significant deficiencies in executive functioning (impaired working memory, continued attention inhibition) and decreased motivation (change in the processing of reinforcement and incentives) compared with their peers without ADHD (Evans, Ling, et al., 2018).

ADHD also leads to inconsistent academic performance. Sensory overload (paying attention to all incoming stimuli) and emotional dysregulation are typical characteristics of individuals with ADHD (Agarwal & Sarthi, 2020).

4. Mindfulness Practice:

Mindfulness is the practice of being present intentionally in the current moment with an open mind (Kabat-Zinn, 2003). Mindfulness training helps to develop an awareness of the present moment to reduce the number of automatic responses and increase the exercise of choice in behaviors.

Mindfulness practices evolved from the Vipassana meditation, focusing on a single object like their own breath and re-shifting attention whenever they get distracted (Kabat-Zinn, 2013).

5. Mechanism of Meditation:

Meditation improves cognitive efficiency during attentional tasks in various brain areas (Wang et al., 2020). Several studies have indicated that Meditation can improve executive function even after participating in short-term programs among inexperienced meditators (Chiesa et al., 2011; Taren et al., 2017).

In many forms of Meditation, individuals are encouraged to direct their attention toward internal experiences such as bodily sensations, emotions, and thoughts (Bostic et al., 2015).

The ability to focus and maintain attention in the present moment may be beneficial for people with ADHD, as one of the core symptoms of ADHD is inattention. Further, the meditators are encouraged to accept and let go of whatever thoughts, feelings, and emotions arise in the present moment without judgment.

Another potential mechanism by which Meditation might affect ADHD symptoms is by regulating depression (Kjaer et al., 2002).

Since medications for ADHD primarily target dopamine and norepinephrine transporters to increase synaptic levels, there may be a possibility that Meditation could exhibit similar effects through the same means.

6. Types of Meditation:

Meditation can be divided into two general types (Barrows & Jacobs, 2002; Krishnamurthy & Telles, 2001).

- a. Concentrative Meditation
- b. Mindfulness Meditation

(6.1) Concentrative Meditation:

Concentrative Meditation involves focusing on an object and maintaining attention until the mind achieves stillness. Its continuous practice aids in relaxation, clarity of mind, and calmness. A different range of items could be chosen as the object of focus. Words, light, colors, geometric forms, and ideas can be used to focus attention.

Concentrative Meditation is represented in modern medicine in two ways - "Transcendental Meditation

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(TM),” which was introduced to the West—during the 1960s, and the “Relaxation Response,” which was developed by Benson (Benson & Klipper, 1975).

(6.2) Mindfulness Meditation:

Mindfulness Meditation is the process of creating an open awareness of the different contents of the mind that are emerging continuously. After consistent practice, the subject will be able to develop an ability to observe their thoughts and emotions without reacting to them.

Meditation, either concentrative or mindfulness, can enhance the subject’s ability to concentrate.

Meditation also helps to relieve the core symptoms of ADHD. However, any meditation intervention will use both concentrative and mindfulness together. Concentrative Meditation utilizes sustained attention, whereas Mindful Meditation improves self-control.

7. Role of Parent Training in Meditation:

Parents of children with ADHD have high levels of parenting stress to the point of being at risk for psychopathology. This stress impacts their parenting and the quality of parent-child relationships, further affecting the child’s functioning. This predicament prevents the parents from engaging in parenting behaviors that help remedy their child’s psychopathology (Evans, Ling, et al., 2018). Bhide (Bhide et al., 2016) showed in a large cross-sectional study of children with and without ADHD (n=391) that negative parenting behaviors underpinned by stress resulted in poorer social and emotional functioning among the children with ADHD. Thus, there is a need to develop evidence-based psychological interventions involving parents to improve the outcomes for these children. So involving and engaging parents in treating childhood ADHD is critical (Evans, Ling, et al., 2018).

Involving parents in meditation interventions for children with ADHD may benefit the parents in addition to the children. Mindful parenting theory states that when mindful parenting practices are followed, parents are more aware and accepting of their children’s needs. They tend to be less focused on narratives and more forgiving when the children are wrong. They also create family content that allows a better capacity to respond rather than react to the child’s behavior. This process enables more enduring

satisfaction and enjoyment in parent-child relationships (Evans, Ling, et al., 2018).

8. Efficacy of Meditation Intervention:

Researching the efficacy of mindfulness training in children and adults is a new domain. Existing evidence has demonstrated that it positively affects psychological well-being, pain management, depressive symptoms and anxiety, negative behavior, cognitive executive functions, and attention in children and adults.

9. Results:

After an in-depth review and analysis of the qualitative and quantitative data from meditation-based research studies and their impact on ADHD, significant qualitative and quantitative data have been listed and tabulated.

(A) Qualitative Studies on the Efficacy of Meditation :

a. Reduction in ADHD symptomatology:

Several studies suggested mindfulness as a helpful potential intervention for children with ADHD (Huguet et al., 2017) due to a significant reduction in ADHD symptomatology. Mindfulness meditation received preliminary support as an effective strategy for dealing with ADHD in teenagers and adults (Cairncross & Miller, 2016). According to their study, there was a p-value of 0.042 for ADHD, anxiety, and cognitive inhibition and 0.043 for processing speed.

Mindfulness training increases the ability to focus due to the practice of constantly re-shifting attention from distracting thoughts to their breath (Keng et al., 2011). Regular practice of Sahaj Yoga Meditation decreased the complexity of EEG patterns, indicating more focus and attention (Aftanas & Golocheikine, 2001). Sahaj Yoga Meditation also increases concentration and memory, facilitating better academic performance (Agarwal & Sarthi, 2020).

b. Self-Regulation:

Mindfulness meditation aids in better self-regulation and modifies the neural connectivity in networks to control the mind’s wandering and other mental activities (Sood & Jones, 2013).

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c. Emotional Regulation:

Mindfulness practices result in enhanced emotional regulation due to the individual's understanding that emotions are transient and can be dealt with in a non-reactive manner (Chambers et al., 2009).

d. Optimism:

After five weeks of mindfulness training, the individuals showed shifts in asymmetric frontal patterns connected to positive emotions (Moyer et al., 2009).

e. Compliance:

Mindfulness training also facilitates the development of compliance, maximizing family life satisfaction (Singh et al., 2010).

f. Executive Functioning:

Neurodivergent students with ADHD typically have deficits in their executive functioning, which improved significantly after undergoing mindfulness training for eight weeks (Flook et al., 2010).

g. Cognitive Functioning:

The long-term practice of Sahaja Yoga Meditation activated the fronto-parieto-temporal areas of the brain and more extensive grey matter, resulting in better cognition, emotional regulation, focus, and optimism (Hernandez & Caçola, 2015).

h. Mental health:

The mindfulness programs have decreased clinical symptoms of anxiety, depression, somatic complaints, attention, and aggression (Huguet et al., 2017).**(B)**

Quantitative studies on the Efficacy of Meditation:

Sl. No.	Author & Year of Publication	Age & characteristics of participants	Type of Intervention	Qualitative Outcomes	Quantitative Outcomes Effect size (Hedge's g) (95% CI)
1	(Carboni et al., 2013)	8 yr. old male, n=4	Mindfulness practices based on the technique of Mindfulness-Based Stress Reduction (MBSR)	Increased on-task behavior and decreased hyperactivity	Hyperactivity (P) 1.12 Inattention (P) 0.39 Hyperactivity (T) 0.53 Inattention (T) 1.04
2	(Mehta et al., 2011)	6 to 11 yr. olds, n=76	Meditation Based Therapy	School performance improved in 91% of children, while 40% moved into the normative range.	ADHD Symptoms - 2.2
3	(Mehta et al., 2012)	6 to 11 yr. olds, n=69	Follow-up study	Improvement sustained for the one-year term of the study	ES = N/A
4	(Singh et al., 2016)	10-12 yr. old males, n=4	Samatha Meditation	Significant improvement in engagement & correct answers to math questions	Engagement 4.38 Problem-solving 9.11

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5	(Bögels et al., 2013)	10 yr. old male and mother, n=1+1	Mindfulness for children and parents	Decrease in inattention & stress in child and mother. Better sleep and relationships for both	ES = N/A
6	(Harrison et al., 2004)	4 to 12 yr. old, n=26 With parallel parent group	Sahaja yoga meditation	Decreased ADHD symptoms, increased self-esteem, sleep, and relationship quality	ADHD Symptoms (P) 1.3 Self-esteem (P) 0.75 Parent-child relationship 0.66
7	(Haydicky et al., 2015)	13 to 18 yr. old, n=18 With parallel parent group	Mindfulness-Based Cognitive Therapy (MBCT)	Reduced inattention, conduct and peer-issues	Inattention (P) 0.78 Hyperactivity / Impulsivity (P) 0.42 Inattention (C) -0.15 Hyperactivity / Impulsivity (C) 0.11
8	(Singh et al., 2016)	10-12 yr. old male + mothers, n=2	Mindfulness sessions with mothers	Increased compliance, and mother's satisfaction	Child compliance (P) 0.49 Child compliance (C) 1.65 Satisfaction in a relationship (P) 0.92 Satisfaction in a relationship (C) 1.59
9	(Van der Oord et al., 2012)	8 to 12 yr. old, n=22 with 22 parents	Mindfulness-Based Stress Reduction (MBSR) & Mindfulness-Based Cognitive Therapy (MBCT)	Decreased ADHD behavior and stress	Inattention (P) 0.80 Hyperactivity / Impulsivity (P) 0.56 Parent Stress 0.57 or 0.85
10	(Zhang et al., 2017)	8 to 12 yr. olds, n=11, 11 parents, parallel parent group	Mindfulness groups	Improved Conners and detectability omissions	Conners-d (C) 0.73 Conners-o (C) 2.29

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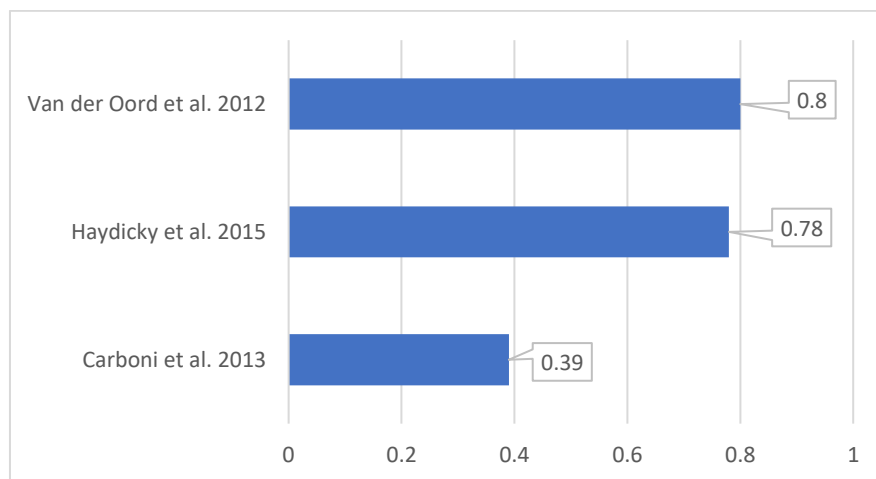
P-Parent Report

C-Child Report

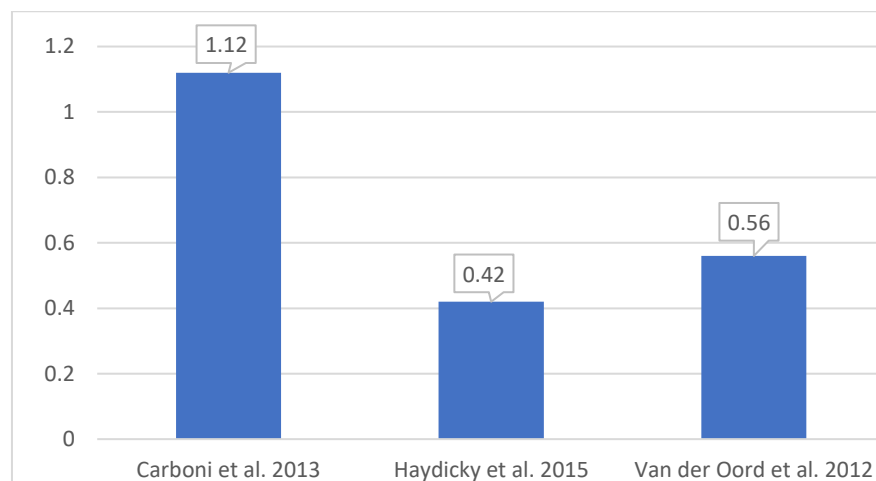
MBSR - Mindfulness-Based Stress Reduction

MBCT - Mindfulness-Based Cognitive Therapy

Graphical Representation of Quantitative Data:



Graph 1: Representation of Effect Size of Meditation-Based Interventions on the Inattention component of ADHD



Graph 2: Representation of Effect Size of Meditation-Based Interventions on the Hyperactivity component of ADHD

10. Discussion and Interpretation:

Analysis of Effect Sizes:

Effect sizes were calculated using the Hedges' g . The standardized mean difference is interpreted using the same criteria as Cohen's d . Cohen's d is used to correct the biases arising from smaller sample sizes. An ES of 0.2 reflects a "small" effect size, 0.5 indicates a "medium" effect size, and 0.8 represents a "large" effect

size. On the whole, positive effect sizes show an improvement in functioning, while a negative effect size indicates poor functioning or no improvement (Evans, Wyka, et al., 2018).

Multiple studies reported large effect sizes in learning outcomes and reduced ADHD symptoms after administering mindfulness interventions. It was also observed that the mindfulness interventions (MI)

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yielded better results when parent training was included as part of child MI (Evans, Wyka, et al., 2018).

Limitations of Meditation-Based Interventions:

Meditation-based interventions include a wide variety of interventions, including mindful walking, mindful yoga, mindfulness-based stress reduction therapy (MBSRT), and mindfulness-based cognitive therapy (MBCT). Due to this diversity, gauging the effect size of Meditation has been a challenging task.

11. Conclusion:

There are diverse worldwide guidelines for the management of ADHD. However, the US guidelines recommend pharmacological treatment for children with mild ADHD or preschool children. On the contrary, UK guidelines recommend pharmacological treatment for ADHD children with severe symptoms and impairment or who have refused non-pharmacological treatment (Catalá-López et al., 2017).

Evans (Evans, Wyka, et al., 2018) completed a qualitative and systematic review of yoga, mindfulness, and Meditation literature for ADHD. He found better consistent improvement in ADHD symptoms and better outcomes for parents. As the reviewed study was of poor methodological quality, the author stated that further rigorous investigation of these interventions is required.

Overall findings of these studies indicate that yoga and mindfulness meditation can be a potential treatment for ADHD (Agarwal & Sarthi, 2020). Children who have consistently pursued Meditation have also reported feeling more calm, relaxed, and focused, with reduced anxiety and increased confidence (Agarwal & Sarthi, 2020).

In the absence of conclusive and definite evidence and the majority of studies having smaller samples and pilot studies with medium to large effect sizes, it will be safe to say Mindfulness Interventions (MI) seem to be a potential and promising intervention for ADHD. Hence, Mindfulness Interventions can be administered in addition to existing pharmacological treatment as a complementary therapy for ADHD or as an alternative therapy to pharmacological interventions. The advantages of using Meditation include its lack of unwanted side effects, cost-effectiveness compared to

clinical treatment, and easy accessibility as a self-care tool.

12. Recommendations for Future Research:

Use randomized controlled trials to increase the reliability and validity of research results. Incorporating higher rigor in methodology, using a larger sample size, and isolating the outcome of parent interventions from the outcomes of child interventions, would help improve the quality of Research studies on Meditation.

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