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REVIEW ARTICLE

Mindfulness-based interventions for children with attention deficit and hyperactivity disorder

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Mindfulness, Attention Deficit and Hyperactivity Disorder, Review, Therapeutics.

Abstract

The prevalence of attention deficit and hyperactivity disorder (ADHD) in children worldwide is 5 to 7.5%. ADHD causes substantial financial impact on health and education services. The burden placed on caregivers affects family dynamics and marital relationships. Parents often resort to punishment in response to their children's behavior, which creates a vicious circle in which maladjusted child behavior intensifies. Professionals from different areas manage cases of ADHD differently, posing a challenge to healthcare providers and creating demand for alternative options. Mindfulness is a meditation-based intervention that helps children develop emotional self-regulation and parents manage stress, and aids in child rearing. This paper describes the rationale and clinical evidence in favor of the use of mindfulness interventions in children with ADHD. **Method:** This literature review included articles published between 2000 and 2021. **Results:** A total of 351 articles, six of which randomized clinical trials and four systematic reviews, were included in the review. In children, the findings indicated improvement in ADHD symptoms in the areas of impulsivity, attention, aggressiveness, and emotional regulation. In parents, improvements were seen in stress levels and mindful parenting. **Conclusion:** The review suggested benefits from mindfulness interventions for children in internalizing symptoms and ADHD, in addition to benefits to parents in stress management, parenting practices, and interfamily relationships. However, longitudinal research must be conducted to confirm the benefits and sustainability of long-term effects.

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INTRODUCTION

Attention deficit and hyperactivity disorder (ADHD) is a neurodevelopmental condition defined by impaired levels of attention, disorganization, and/or hyperactivity-impulsivity, present in more than one setting and beginning before the age of 12 years. According to the diagnostic criteria stipulated in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), inattentive and disorganized behavior refers to the inability to focus on a single task, poor listening skills, and loss of items at levels inconsistent with the subject's age or development. Hyperactivity, on the other hand, implies excessive activity and restlessness, while impulsivity refers to rash actions that occur without premeditation[1]. This condition is often associated with comorbid conditions such as externalizing disorders, when associated with behavior disorders, and internalizing disorders, when associated with mood or emotion disorders; it may result from the emotional dysregulation of the affected child[2].

In children, ADHD has a prevalence of 5 to 7.5% worldwide. Boys are preferentially affected, by a ratio of 3:1[3]. The estimated annual cost of ADHD in the United States resides in the $143-266 billion range, primarily related to health care, followed by education, caregiver productivity loss, and crime[4].

The burden the condition places on caregivers may have emotional impacts, with increased propensity to develop psychiatric disorders, and financial impacts as well, due to cost of care and the inability of the primary caregiver to keep a job while taking care of a child with ADHD[5]. The condition affects the entire family, which often sees one of its members converted exclusively into a caregiver submitted to an extreme workload that ultimately disturbs marital relationships[6]. Parents tend to become less patient and more impulsive, especially in cases of ADHD with a hereditary component[7]. They resort to punishment in response to their child's behavior, which creates a vicious circle in which maladjusted child behavior intensifies[8].

ADHD is a complex condition that requires specialized medical care, involving psychiatrists and neurologists; multidisciplinary therapeutic services including occupational therapy, speech therapy and psychology, combined with more attentive coordination of the care provided are a necessity[9]. ADHD is a challenging condition managed with the involvement of specialists from different areas of expertise[10].

Medications and psychosocial interventions are the most commonly used treatments to mitigate the symptoms of ADHD in children and adolescents[11]. Methylphenidate is the main drug prescribed to children with ADHD. However, about 30% of the patients cannot afford the medication, cope with its adverse effects, or comply with treatment requirement[11,12]. The difficulties in treating children and adolescents with ADHD in the long term have called for alternative treatment options, and mindfulness-based approaches have gained attention in medical literature.

Mindfulness is based on meditation techniques devised to increase awareness by paying purposeful attention to the present moment, improve non-judgmental observation, and decrease automatic responses[13]. Individuals are encouraged to direct their attention to internal experiences such as bodily sensations, emotions, thoughts, and action tendencies, as well as to environmental stimuli such as the scents and sounds around them[14].

The ability to focus and maintain attention in the present moment and return to a state of attention whenever a distraction occurs – elements individuals on mindfulness programs are trained on – can be particularly beneficial for children with ADHD, since one of their main symptoms is inattention. In addition, the ability to observe thoughts without judging them allows the recognition of emotions and thought patterns to interrupt automatic responses. Individuals in mindfulness programs learn to respond rather than to react to stimuli, which is beneficial for the management of hyperactive-impulsive behavior[15].

Family-focused mindfulness is a tool that helps children with emotional self-regulation and parents with stress management and child rearing. It has also been referred to as mindful parenting, in that it draws conscious attention to the present moment, rather than letting emotions drive one's thoughts, so that parents are aware of their children's needs at all times[16]. This approach allows for the regulation of emotions, behavior, and cognitive processes, especially in response to stress. This may be particularly relevant for overburdened families to decrease automatic interactions with their children and pave the way for more positive relationships[17].

The high prevalence of ADHD, its impact on public health, on psychosocial issues, and family dynamics represent a challenge in clinical care. This review evaluated the rationale and clinical evidence for the use of mindfulness interventions in children and adolescents with ADHD and their caregivers.

METHOD

This non-systematic review of the literature on mindfulness as a therapy for children and adolescents with ADHD and their caregivers was based on searches for articles made on the following electronic databases: Lilacs/SciELO, Medline/PubMed, BVS/Bireme, Cochrane/Central, Scopus/Elsevier, and Embase/Elsevier. The searches included articles published from January 2000 to June 2021 in English, Spanish, and Portuguese. MeSH and entry terms were used in Medline and Cochrane, while Emtree was used in Embase and Decs in Lilacs. The search terms chosen were: Mindfulness; Parenting; Child Rearing; Parent-Child Relations; Child; Adolescent; Pediatrics; Child behavior disorders; Attention Deficit Hyperactivity Disorder. The term Mindful Parenting and various other terms such as text words, synonyms, acronyms, related terms, and other references found in the selected articles were also used in the search.

The inclusion criteria were as follows: 1) study design – randomized clinical trial or systematic review; 2) participant age – children and adolescents aged up to 19 years; 3) diagnosed conditions – ADHD diagnosed by a specialist and/or based on the DSM-5; 4) interventions administered – mindfulness-based, defined as purposeful non-judgmental awareness of the ongoing experience (Kabat-Zinn 2003)[13]; 5) intervention administered to children and adolescents and/or their caregivers.

The articles identified in the search were initially evaluated based on their titles and abstracts. Articles deemed relevant were read in full and the ones that met the inclusion criteria were selected for the literature review. Duplicates were excluded.

The selected articles were identified by title, author's name, year of publication, type of study, and country. Next, they were analyzed for participants: children and/or parents, size of study population, age, sex, enrollment, presence of comorbid conditions in children with ADHD, past or concomitant use of other therapies, associations with other diseases, family socioeconomic status, level of education of parents, family makeup, and presence of ADHD in a family member. As for the description of the employed mindful parenting techniques, the articles were analyzed according to the type of technique, clinical fundamentals, training protocol, and data related to the administration of the intervention. The latter point revolved around the use of technique, participant training, and execution of the study. We tried to identify the presence of control groups, randomization, blinding, control for training effectiveness, and continued execution. Regarding clinical outcomes of interest, the articles were analyzed based on the descriptions and assessments they offered, as well as the analysis performed based on the evaluation method, evaluators, blinding, evaluation steps, follow-up time, losses during follow-up, and adverse effects.

RESULTS

Initially, 351 articles were identified (Figure 1). Of these, 310 were excluded after the titles and abstracts were read and duplicates discarded. Of the 41 articles read in full, 29 were excluded for not meeting the study objectives and two for having only a pilot project described. Ten articles that met the inclusion criteria and the study objective were included. Six were randomized clinical trials (RCT) and four were systematic reviews (SR).

Tables 1 and 2 mention the authors of the six randomized clinical trial studies and the employed techniques, and the rationale and protocols followed during the course of the studies, respectively. Both the duration of weekly sessions and the length of the interventions varied among the included studies, ranging from 18 to 120 minutes and six to 12 weeks (Table 2), respectively.

The administration of the interventions had distinct goals such as improvement of ADHD symptoms, internalizing and externalizing symptoms, parental discipline, parental stress, parental well-being, and mindfulness as described in Table 3.

Diagnoses of ADHD were confirmed by physicians using the DSM-IV in one study, the DSM-5 in three studies, and the SWAN rating scale in one study; one study accepted the diagnosis from the medical center where participants were enrolled.

The size of the included populations varied substantially among studies, with a predominance of children with ADHD aged 5-12 years and males (Table 4). Most participants were enrolled from specialist clinics and hospitals. Although the association of ADHD with internalizing and externalizing disorders is common, only three studies described these comorbid conditions, with one not describing the proportion of affected participants. Two studies described the proportions of participants previously submitted to other types of behavioral therapy.

Exclusion criteria varied widely in the included articles. Patients with intellectual disabilities were excluded in five studies, autistic patients in another five, patients with a psychiatric disorder in four, and patients with neurological and behavioral problems in one study. No study described the associated conditions present in participants, although one study excluded individuals with other medical conditions. Regarding use of medication, one study excluded patients on irregular ADHD medication and two removed patients on ADHD medication (Table 4).

Table 5 shows the characteristics of the parent populations. Only one study reported the family socioeconomic status, while four included level of education, which comprised mostly individuals with a higher education degree. In the studies showing marital status, most parents were married. Only two studies assessed the presence of ADHD symptoms in parents. The studies requested the presence of at least one parent, which in most cases were the mothers of the children with ADHD.

The control groups of the studies included children with ADHD who received other behavioral therapies or children from treatment waiting lists (Table 6). Although all studies called themselves randomized, not all clearly described the randomization procedure, and were thus categorized as non-randomized. Only two studies described blinding for the employed tool. Intervention quality control was described in some studies, which included trained mindfulness instructors, while control of intervention delivery was based on the evaluation of session participants and in the performance of home assignments. Some participants were lost during follow-up for not achieving minimum session attendance requirements or leaving the study.

The outcomes were assessed differently: two studies did not include parents in the intervention program, although in one of them the effects of the intervention on parental stress were assessed (Table 7). Two studies did not include children in

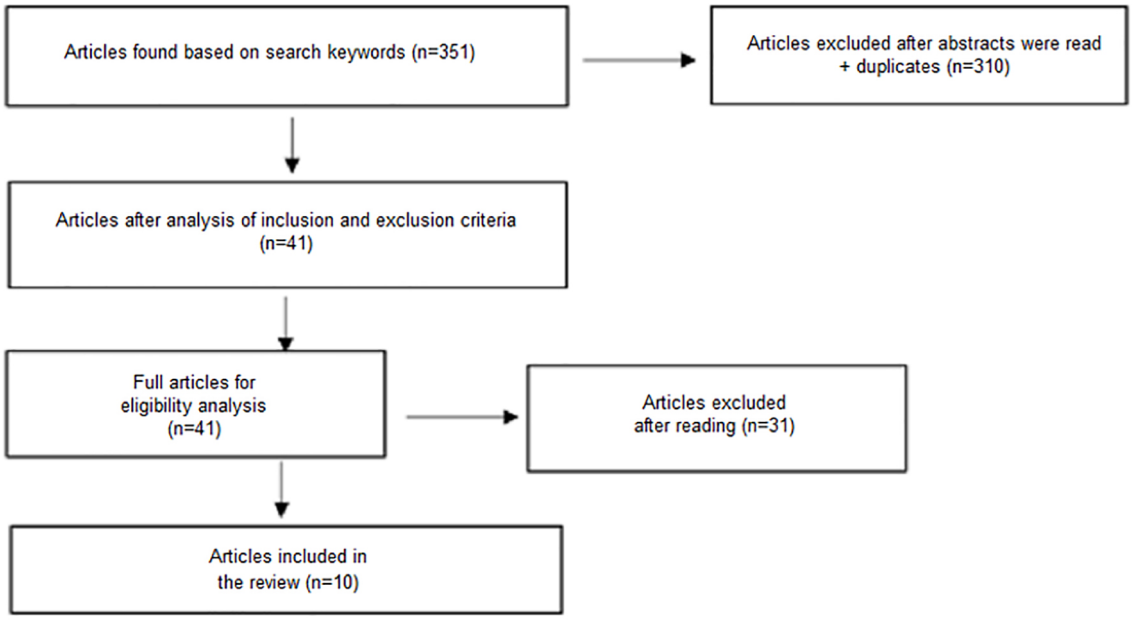


Figure 1: Article selection flowchart

Table 1. Randomized Clinical Trials.

Author	Year	Country
OOord, S; et al[18]	2012	The Netherlands
Behbahani M, et al. (2018)[19]	2018	Iran
Santonastaso O, et al. (2020)[20]	2020	Italy
Huguet A, et al. (2019)[21]	2019	Spain
Lo HHM, et al. (2020)[22]	2017	Hong Kong
Mah JWT, et al. (2021)[23]	2020	Canada

Table 2. Mindfulness-based techniques.

Study	Technique	Fundamentals	Protocol
[19]	*Mindfulness + MP*	Sintomas de TDAH nos pais e nas crianças, PA e estresse parental	90 min/semana por 8 semanas
[21]	MBSR	Attention regulation, automatic response, effect on mindfulness, and ADHD symptoms	18-90 min/week for 8 weeks
[22]	MBSR + MBCT	Emotional dysregulation and ADHD symptoms.	75 min/week for 8 weeks
[23]	MP	Parental stress and ADHD symptoms	90 min/week for 8 weeks
[24]	FBMI	Inattention and hyperactivity symptoms, internalizing and externalizing symptoms, parental stress, well-being and parental mindfulness	60-90 min/week for 6 weeks
[25]	MBCT + MBSR + MP	Parental emotional self-regulation, parental stress and parenting practices	120 min/week for 12 weeks

Note: Mindful Parenting (MP), Mindfulness-Based Cognitive Therapy (MBCT); Mindfulness-Based Stress Reduction Program (MBSR) and Family-Based Mindfulness Intervention (FBMI).

Table 3. Outcome Characteristics.

Study	Outcome of Interest
[19]	Child behavior, parental stress, parental discipline, parental ADHD scale, and mindfulness.
[21]	Neuropsychological testing, academic skills, child behavior scale, behavior checklist, anxiety and depression, mindfulness, and parental stress.
[22]	Psychopathy assessment, intelligence assessment, ADHD assessment, social and communication skills, and child behavior.
[23]	Parental stress and ADHD symptoms
[24]	ADHD symptoms in children, child behavior, child attention test, parental stress, adult ADHD symptoms, MP, quality of life, and parent heart rate variability.
[25]	MP, effectiveness of parental discipline, parental discipline method, parental stress, parental emotional self-regulation, ADHD symptoms in children.

Note: Attention deficit and hyperactivity disorder (ADHD); mindful parenting (MP)

Table 4. Population characteristics (children) – inclusion and exclusion criteria.

Study	No	Age (years)	Male Sex	Enrollment	Internalizing/ externalizing symptoms	Other Therapies	Associated Conditions
[19]	22	8-12	72%	Clinic	Yes, 13%	Yes, 27%	ND
[21]	35	7-11	74%	Hospital	NI	No	Excluded
[22]	72	7-11	70%	Hospital	Yes, 48%	No	ND
[23]	60	7-12	69%	Hospital	NI	No	ND
[24]	123	5-7	83%	Escola	NI	No	ND
[25]	63	6-11	79,3%	Clínica	Yes	Yes, 26%	ND

Nota: NI = não informado; ND = não descrito.

Table 5. Population characteristics (parents) – inclusion and exclusion criteria.

Study	Socioeconomic status	Level of education	Family makeup	ADHD
[19]	NI	66.6% higher education	NI	Yes
[21]	NI	NI	NI	NA
[22]	NI	NI	NI	NA
[23]	NI	68% higher education	NI	NA
[24]	NI	44% higher education	91% married	Yes
[25]	Middle class	58,6% higher education	82.8% married	NA

Note: Not informed = NI; Not assessed = NA

Tabela 6. Intervention characteristics – allocation, training and control .

Study	Control group	Randomization	Blinding	Quality control	Delivery control
[19]	Waiting list	No	No	Yes	Yes
[21]	Yes	Yes	Yes	Yes	No
[22]	Yes	No	No	No	No
[23]	Yes	Yes	No	No	No
[24]	Waiting list	Yes	Yes	Yes	No
[25]	Yes	Yes	No	Yes	Yes

the intervention program, although their ADHD symptoms were assessed through a questionnaire answered by their parents.

The outcomes of the intervention on parents were assessed with different scales and included the following items: mindful parenting (MP), parent behavior, stress, ADHD symptoms, World Health Organization (WHO) wellness index, heart rate variability, and the mindfulness awareness scale (Table 6). Some scales took parent-child interaction into

Table 7. Outcome characteristics.

Study	Evaluation method	Evaluator	Blinding	Evaluation steps	Reevaluation	Adverse effects
[19]	Q	P, Tr & I	No	1 week before and after the last session	8 weeks	None
[21]	T & Q	P, A & E	Yes	Before intervention and 2x within 2 weeks after the intervention	2 weeks	None
[22]	T & Q	P & E	No	Pre- and post-intervention	1 week	No
[23]	Q	P	No	Pre- and post-intervention	8 weeks	No
[24]	T & Q	P & E	Yes	Pre- and post-intervention	No	No
[25]	Q	P	No	Pre- and post-intervention	No	No

Note: T=test; Q=questionnaire; P=parents; Tr=teacher; E=examiner and I=instructor.

consideration. In children, child behavior, ADHD symptoms, social and communication skills, neuropsychological tests, academic skills, intelligence, and psychiatric conditions (anxiety, depression, and psychopathy) were assessed. Data were collected from specific tests with the children and questionnaires answered by their parents, teachers, or by the children themselves. Four studies followed the participants from 1-8 weeks after the end of intervention.

DISCUSSION

Despite the increasing number of publications in medical literature on interventions involving mindfulness, few randomized clinical trials and systematic reviews addressed the object of the present study – the effects of mindfulness interventions on children and adolescents with ADHD and their parents.

There are different types of mindfulness programs, such as mindfulness-based stress reduction (MBSR), mindfulness-based cognitive therapy (MBCT), mindful parenting and family-based mindfulness intervention (FBMI). All feature the same basic format and structure of mindfulness sessions with exercises to incorporate mindfulness into daily life, body awareness, and how to deal with thoughts and emotions[24]. The types of mindfulness-based techniques were distinct in the studies, and although they all derive from the same concept, the goal of each approach is different, and include specific items such as parent-child interaction in MP or stress reduction in MBSR. In MP, parents are taught to pay attention to their own breathing before responding to the behavior of their child via an impulsive reaction. In MBSR, parents are taught about how stress works and how to approach it using mindfulness skills[24].

The comparison between clinical trials was hampered because the studies discussed different mindfulness-based techniques with varying rationales and protocols with respect to session length and duration of intervention (Table 2).

There was great diversity in the population selection criteria, which affected the characterization of the study group and analysis of outcomes (Table 3). The quality of the reported outcomes may have been influenced by the age of the included children in the case of self-reported outcomes, and by the level of interaction between parents and their children in outcomes reported by parents. The presence of comorbid conditions in the children, the type and severity of ADHD, and prescribed medication (in the past, currently, or lack thereof) varied widely and affected the homogeneity of the selection, leading to confounding bias. In most studies, there was a higher proportion of males, which may be justified by the higher prevalence of the disorder in this gender. In some studies, children who had undergone prior treatment for ADHD such as behavioral therapy were included, which possibly influenced the outcomes.

Regarding the families included in the studies, participants were mostly married parents with a college degree (Table 4). Level of education may affect adherence to the intervention, marital stability, and the quality of inter-family relationship. Not all studies described the presence of ADHD in parents or other associated diseases that might hinder adherence to the intervention or its implementation in parenting.

The diverse ethnicity of the families included in the studies may influence outcomes, since cultural factors may encourage the participation of families and generate selection bias. Understanding and adherence to the intervention may also be affected by this factor.

Regarding the intervention, different studies had different control groups, and not all were categorized as randomized studies due to the lack of a description of the randomization process and participant allocation (Table 5). Training effectiveness was rated by mindfulness instructors with different certifications, and few studies included a blinding procedure. Some participants were lost during follow-up for unknown reasons. This may have occurred due to the time

required for the intervention, the difficulty of reconciling it with daily chores, or parents' lack of confidence in the approach.

Some studies performed interventions on caregivers and children, making it difficult to define the most important element – mindfulness for children, for parents, or a combination of both. Not all studies included parents and children in the intervention; in the ones that did, participation involved primarily the mothers of children with ADHD.

Outcomes were collected via questionnaires and tests. Most of the questions in the questionnaires were addressed to the parents, who also participated in the studies, which possibly caused measurement bias (Table 6). Different variables were evaluated and the same factor was assessed using different validated scales, which hindered comparisons between them. No long-term follow-up was performed.

The MP index assesses conscious parenting practices, according to the principles described above. In the analyzed studies, we found that parents of children with ADHD presented lower levels of MP in the same way as parents in psychological distress, regardless of the presence of ADHD. There was evidence of improvement in parental stress and MP after a mindfulness-based intervention[18]. The literature also describes reduced levels of parental stress and benefits sustained for up to one year after the intervention[25].

The studies included in this review described improvements in symptoms of impulsivity and attention[18-23] and aggressive behavior and emotional regulation[21,22] in children with ADHD. In the school setting, the improvement was seen only in attention, with no effect on behavior[18]. These results corroborate the benefits from mindfulness programs described in the literature on the main symptoms of ADHD, with emphasis on the inattention component[26].

The systematic reviews included in this article did not recommend the clinical application of mindfulness interventions in children with ADHD due to the quality of the studies included. However, they pointed out some possible uses for them: improvement in attention in individuals with ADHD, regardless of developmental stage[27]; a psychoeducational tool for parents in the general community to reduce stress levels and increase emotional awareness in their children[28]; complementary treatment to drug therapy and behavioral interventions[29]; interventions to decrease parental stress and build confidence in parenting[30].

These results must be interpreted with caution given the heterogeneity of the studies in terms of participant age, control conditions, year of publication, quality of the study, type of meditation, duration of intervention, and type of informant, in addition to the issues mentioned above.

CONCLUSION

This review presented mindfulness-based interventions and their role in managing symptoms of children with ADHD and improving the parent-child relationship, particularly by controlling attention symptoms, hyperactive behavior, and internalizing symptoms in children, and reducing parental stress and improving family relations.

Although there is growing evidence of the therapeutic benefit of these interventions for children with ADHD and their families, further studies are needed to confirm these positive findings. Future longitudinal studies should evaluate individuals with ADHD under the light of the following aspects: for children - comorbidities, ADHD severity and subtype, and use of associated therapies; for parents - family makeup, socioeconomic status, and presence of ADHD; for interventions - allocation, training and control, randomization, and blinding; for outcomes - assessment protocol and length of follow-up.

FINAL CONSIDERATIONS

The adoption of mindfulness within the context of family life may equip parents with coping skills to deal with normative stressful events, prevent the emergence of excessive anger, and help children with ADHD self-regulate their emotions. The use of mindful parenting practices contributes not only to an improvement in the internalizing and externalizing disorders experienced by their child, but also to a more positive inter-family relationship.

This may extend to other conditions of parents in psychological distress. As mentioned in this article, parental distress is associated with reduced levels of mindful parenting, and mindfulness interventions may be helpful in this context.

Future research should consider the subtypes and severity of ADHD, as well as the use of multiple informants to allow the assessment of the child in different settings. It might be interesting to compare the combinations of parents and children trained on mindfulness together versus children and parents trained separately versus both caregivers receiving training on mindfulness.

The development of maintenance and advanced programs in mindfulness might encourage the continuation of related practices after the end of the intervention. Sustainability of the long-term effects must be analyzed.

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