

The Effects of Mindfulness Training on Attention in Normal Children

Liu Fanmi, Li Xiaotong*, He Yanzhi, Li Zhaolun, Li Huazhi, Fan Luyue, He Fangfang
Sichuan University of Science & Engineering, Zizhong 643002, Sichuan, China

**Corresponding Author*

Abstract: This article aims to sort out and discuss the effect of mindfulness intervention on normal children's attention, and provide scientific and reliable support for the fields of psychology and education. A literature search was performed on the empirical studies up to January 15, 2023, in Web of Science, PubMed, Ebsco, Elsevier, CNKI, Wanfang, and VIP databases. The quality of the literature methods was assessed using the PEDro scale. A systematic analysis method was used to conduct a qualitative analysis of the literature. 146 articles were searched out, and 21 articles were finally screened out. Different researchers use different research designs, select children of different ages, and use different testing methods, all of which show that mindfulness intervention has a significant effect on the attention of normal children. Mindfulness training can significantly improve the attention of normal children.

Keywords: Mindfulness Training; Normal Children; CNKI

1. Introduction

Mindfulness is a process in which an individual strives to maintain awareness of various physical and mental experiences at this moment, and at the same time, in this process, always maintains an attitude of not judging any awareness (Kabat-Zinn, 2003). Among them, "awareness" refers to an individual's awareness and awareness of all changes in the inner world and the outer world (Hao Hailong, 2021). A large number of studies have confirmed that mindfulness has a good healing effect on various physical diseases and psychological disorders (Wang Chengli, 2012), that is, mindfulness intervention can improve chronic pain, depression, addiction, etc. (Creswell, 2017). In the past decade or so, there have

been more and more mindfulness-based intervention studies, and the research direction has shifted from clinical to the workplace, prison, military, school, and people of all ages (Creswell, 2017). Attention refers to the intentional or unintentional direction and concentration of mental activities on specific things (Peng Danling, 2019), which is an essential psychological attribute for the generation and progress of all mental processes. Previous studies focused on the theory and physiological mechanism of attention, attention deficit disorder (ADHD), and rarely involved intervention studies on children's poor attention quality (Chen Junxiong, 2022). However, children are in the stage of high-speed development of attention, and inattention will have a certain impact on classroom efficiency, academic performance, and interpersonal communication. Ding Jinhong took 273 9-13-year-old students in the third and fifth grades of a primary school as subjects and found that the attention of 9-13-year-old children had a significant impact on academic performance (Ding Jinhong et al., 2012). Secondly, the advantage of mindfulness training in cultivating attention lies in its rich content, interesting content, taking into account both curriculum and psychological counseling (Jin Jianshui & Liu Xinghua, 2017), simple operation, and convenient implementation. Mindfulness involves many fields and groups of people. No relevant review articles have been published yet.

To sum up, this paper attempts to obtain reliable results by combing the relevant literature. Provide strong support for the scientific implementation of mindfulness training in school education and family education. [1-15]

2. Method

2.1 Literature Search Strategy

In CNKI, Wanfang, VIP database, PubMed, Ebsco, Web of Science, and Elsevier, using Boolean logic combined with the keyword retrieval method, the time range is from the establishment of the database to January 15, 2023. Chinese search expression: "(Child or infant or pediatric or minor) and mindfulness and attention"; English search expression: "Mindful* AND child* AND Attention".

2.2 Literature Inclusion and Exclusion Criteria

Inclusion criteria: ① The language of the article is Chinese or English; ② The research object is a normal group between the ages of 0 and 18; ③ The type of article is an original article or a dissertation; ④ The article has been published within the past ten years; ⑤ At least use mindfulness ⑥ the design of the study is randomized controlled trial (RCT) or quasi-experimental design

Exclusion criteria: the types of articles are review papers, conference papers, non-

intervention research, qualitative research;

2.3 Literature Screening and Data Extraction

Import the retrieved documents into the document management software EndNote X9.1 to deduplicate the documents; then read the titles, abstracts, methods, and other parts of the documents according to the inclusion criteria and exclusion criteria, eliminate the articles that do not meet the requirements, and keep the documents that meet the standards to form the Thpapers were systematically analyzed in the bibliographic database. Based on this, the researchers further studied the literature, and recorded the basic characteristics of the literature, including the author, year of publication, research design method, research object, intervention method, intervention plan, measurement tools, and other characteristics, and then systematically analyzed the results.

2.4 Literature Quality Evaluation

Table 1. PEDro Scale Score of The Included Literature

Study	Qualification criteria	Random allocation	Hidden allocation	Baseline similarity	Subject blind method	Therapist's blindness	Evaluator blind method	Adequate follow-up work	Intention-to-treat analysis	Statistical comparison between groups	Point measurements and variability measurements reported	Score
Zhang Xiaoli (2021)	√	√	√	√				√	√	√	√	7
Jiao Yuanqian (2016)	√			√				√	√	√	√	5
Wu Xiaoqing (2022)	√	√	√	√				√	√	√	√	7
Hao Hailong (2022)	√	√	√	√				√	√	√	√	7
Hei Xuena (2020)	√			√				√	√	√	√	5
Chen Junxiang (2022)	√	√	√	√				√	√	√	√	7
Xie Jing (2018)	√			√								1
Liu Biwei (2022)	√	√	√					√	√	√	√	6
Cai Yuxiao (2017)	√	√	√	√				√	√	√	√	7
Zhou Yan (2022)	√	√	√	√					√	√	√	6
Cheng Wenxiu (2020)	√	√	√						√	√	√	5
Li Quan (2019)	√	√	√	√				√	√	√	√	7
Ma Chao (2013)	√	√	√	√				√	√	√	√	7
Juan M. Guiote etc. (2022)	√	√	√	√				√	√	√	√	7
Antonio Baena-Extremera etc. (2021)	√	√	√					√	√	√	√	6
Kristen E. Rawlett etc. (2019)	√	√	√	√				√	√	√	√	7
Christian Müller etc. (2021)	√	√	√					√	√	√	√	6
Clemens CC Bauer etc. (2020)	√	√	√	√				√	√	√	√	7
Ricardo Tarrasch (2018)	√	√	√	√				√	√	√	√	7
George Thomas etc.(2016)	√	√	√	√				√	√	√	√	7

The quality of included studies was assessed using the Chinese version of the PEDro scale, which can be used to score the methodological quality of clinical or intervention trials included in systematic reviews across health

and medical research (Cashin and McAuley, 2019) the scale can be used to assess whether the research design is RCT or non-RCT. the scale includes 11 evaluation items, which successively evaluate external validity (item 1),

internal validity (items 2-9), and statistical report (items 10-11). 1 point for each item that meets the criteria, 0 points for non-compliance, and no points for the first items. According to the authors, a score of <4 is considered "poor", 4-5 is considered "fair", 6-8 is considered "good", and 9-10 is considered "excellent". 7, 8 It is important to note that the methodological quality measures produced by the PEDro scale should not be used as a measure of the 'validity' of research conclusions. See **Table 1** for the quality evaluation process and scores. [14-19] Quality evaluation the quality evaluation results showed that among the included

literature, 18 articles were of "good" quality; 3 articles were at the "average" level; and 1 literature was of poor quality.

3. Result

Include the basic features of the article
In the end, 21 articles (pictured) meeting the criteria were included, published between 2013 and 2022, including 13 articles from China, 2 articles from Spain and the United States, and 1 article from Germany, the United Kingdom, Italy, and Israel. Research designs included RCTs, quasi-experimental designs, and cross-lagged RCTs with quasi-experimental interventions.

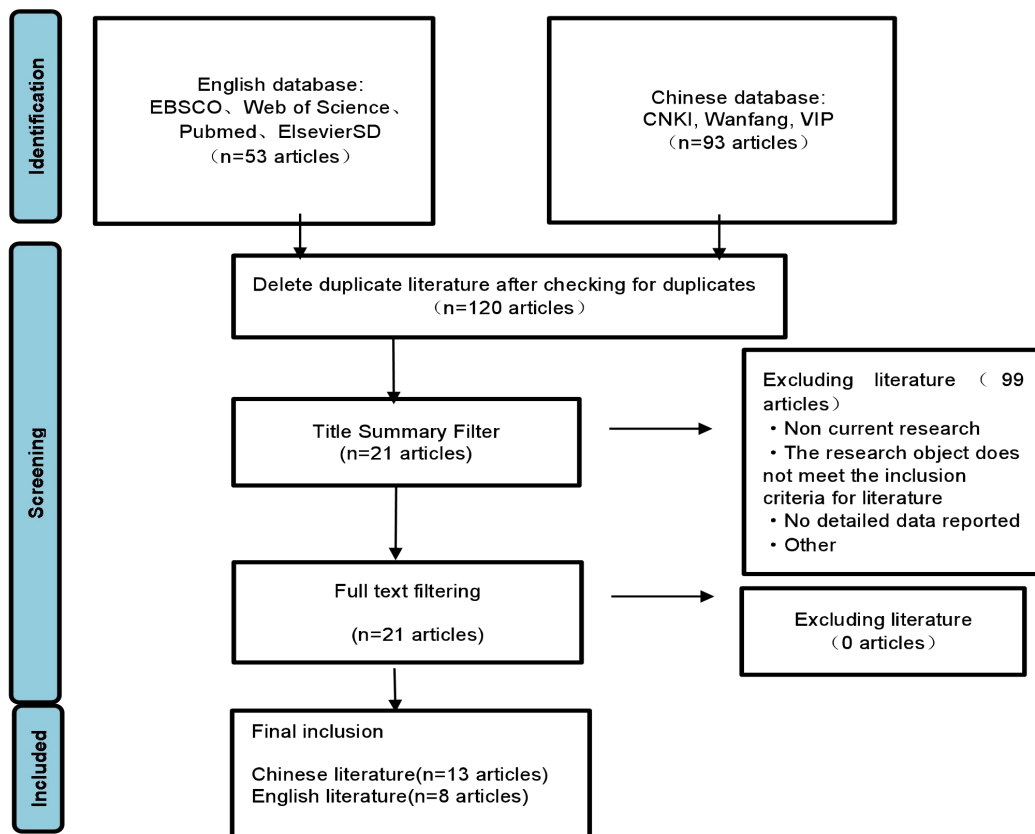


Figure 1: Document Screening Flow Chart

The research on children's attention in the included literature uses the following tools: Attention Network Task (ANT) and its children's version measure the executive network function, orientation network function, and vigilance network function of attention; "Adolescent Attention Test" questionnaire measures attention Transfer, stability, breadth, distribution; qualitative research tools such as interview method, the research object makes a subjective description of the change of their

own attention; "Find Animals" task (Find Animals) measures the sustained attention of children aged 3 to 6; attention the Chinese version of SNAP-IV measures attention; the d2 test of attention measures selective attention and sustained attention; the Sustained Attention to Response task (Sustained Attention to Response) Task, SART), continuous performance task (computed-Continuous Performance Task, CPT) to measure sustained attention; connected visual

search task (Conjunctive Visual Search Task, CVST) to measure selective attention; attention checklist (teacher report) (Teacher-reported Attention Checklist measure), Naming and Inhibition Error Task (NEPSY-II) to measure students' attention; Conners Teachers Rating Scale (Revised) (Conners Teachers Rating Scales-Revised, CTRS-R) to measure inattention and ADHD symptoms, as **Figure 1**.

Result Analysis

Attention refers to the individual's ability to direct and concentrate on mental activities (Eldar, Ricon, & Bar-Haim, 2008).

Four studies used the Attention Network Task (ANT) to investigate the effect of mindfulness training on children's attention. the Attention Network Test measures the functional efficiency of the three sub-networks of the Attention Network: "Vigilance, Orientation, and Executive Control". All three studies have significantly shown that mindfulness training can significantly improve children's vigilance network function and executive control network function (Zhang Xiaoli, 2021; Hao Hailong, 2022; Hei Xuena, 2020). At the same time, Hao Hailong's research shows that mindfulness training still has a certain intervention effect on the attention network function of 9-10-year-old children one month after the training. However, one study (Ma Chao, 2013) found that the orientation network function and executive control network function in the attention network were significantly improved after mindfulness training. the inconsistency in the findings may be due to differences in the intensity and duration of the intervention in the mindfulness training program protocols.

Three studies (Wu Xiaoqing, 2022; Chen Junxiong, 2022; Liu Biwei, 2022) used the adolescent attention test. the reliability and validity test results of the test are consistent with the psychometric standards, and it is often used to measure the attention quality of adolescents and children. All three studies significantly showed that mindfulness training had a positive effect on the quality of attention, that is, the improvement of attentional stability, attentional shift, attentional span, and attentional distribution. Some studies have obtained significant effects in the pre-test, post-test, and follow-up tests through less mindfulness intervention, which may be affected by the practice effect.

One study (Li Quan et al., 2019) used the "find animals" task measurement, which was used to measure the sustained attention of 3-6-year-old children. Another study (Ricardo Tarrasch, 2022) used the computed-Continuous Performance Task (CPT), based on the computerized continuous performance task of Rosvold et al. (1956), which aimed to measure sustained attention. Both studies involved children; both the animal-finding task and the continuous performance task (CPI) measured sustained attention. the results of both studies showed that mindfulness training had a significant effect on improving sustained attention.

Studies (Antonio Baena-Extremera, 2021; Juan M. Guiote et al., 2022; Christian Müller et al., 2021) used the d2 test of attention (The d2 test of attention). the test consists of 14 lines of 47 characters. the stimuli are the characters «d» and «p», which can be accompanied alone or in pairs by one or two small lines, located at the top or bottom of each character. Among them, the d2-R used in Christian Müller's research is often used to measure children's attention. Another study (Ricardo Tarrasch, 2018) used the Conjunctive Visual Search Task (CVST), which is based on the connected visual search task of Treisman and Gelade. A common component measured by the d2 test and the connected visual search task is selective attention. the research results of the four kinds of literature all show that mindfulness training has a significant effect on the improvement of selective attention.

One study (Cai Yuxiao, 2017) used the Attention Deficit Hyperactivity Disorder Rating Scale (SNAP-IV), which is often used to assess attention. the findings of the study showed that mindfulness training significantly improved children's attention levels.

One study (Clemens CC Bauer et al., 2020) used the Sustained Attention Response Task (SART). the SART paradigm is programmed using PsychoPy (Peirce, 2007), a Python library for conducting psychology experiments. the results of this study suggest that mindfulness training can maintain sustained attention on SART.

4. Discuss

This article mainly discusses the effect of mindfulness intervention on children's attention. In the research results, researchers

used different research designs and attention-testing methods, and all came to the conclusion that mindfulness improves children's attention. By observing many studies, researchers found that the effect of mindfulness training on the improvement of attention may be related to the practice content designed in the mindfulness training program. One of the key skills developed in mindfulness practice is the ability to detect shifts in attention and eliminate the interference of conflicting information encountered. This skill may be the reason why mindfulness training can improve attention in the Attention Network Task (ANT). the reason for performing the control function. In the process of mindfulness practice, the researchers' guidance to children can make them learn to keep their focus from shallow to deep; that is, as the frequency of practice increases, children's attention control skills will become more and more proficient, and executive control functions will also be improved. effective training.

In addition, many effective mindfulness exercises also share the following characteristics. One is to design a scientific and reasonable mindfulness training program. These mindfulness programs are designed with the characteristics of children's physical and mental development; according to the characteristics of children's memory and attention, that is, the time of mindfulness training is shorter and the content is more repetitive, and the relevant theories are appropriately adjusted. Many training programs are closely integrated with daily life, and mindfulness training is innovated in the form of stories or games, which greatly mobilizes children's participation and enthusiasm. the second is to strictly regulate the procedures of mindfulness training. Improve the scientific literacy of researchers by participating in training, reading, and consulting a large number of books and materials; at the same time, they also respect the wishes of children, communicate with their parents, and sign the "Informed Consent Form", which follows the ethical and moral norms of psychological research. In addition, in the process of mindfulness training, we strictly follow the relevant guiding principles, strictly grasp the time, and try our best not to cause fatigue to the children. the third is to maintain good trust between children and researchers. It

can be found in many studies that children trust researchers very much; many children will also actively share their feelings in mindfulness training with researchers, which also allows these children to experience the happiness of mindfulness moments.

Disadvantages and prospects:

When the document quality assessment is completed, two researchers will score separately. If there is a disagreement, a unified result will be discussed. Without another round of scoring by a third party, there may be deviations in the document quality scoring results. Secondly, the scoring results show that there are no "excellent" documents among the included documents. the reason for this may be the selection of quality evaluation tools, not necessarily the quality of the documents themselves. the PEDro scale is mostly used in clinical research, and this article sorts out the articles on mindfulness intervention, and the research objects are normal children. None of the items are scored.

This article starts with the influence of mindfulness intervention on attention from the perspective of systematic analysis, and does not further analyze whether the influence of different factors of attention is consistent. Future research can use different dimensions of attention as a starting point to determine the effect of mindfulness intervention. research.

5. Conclusion

The results of the literature included in this article show that mindfulness training can significantly improve children's attention.

Acknowledgments

Project: National college student innovation and Entrepreneurial Training Plan S202210622016.

References

- [1] Jon Kabat-Zinn. (2003). Mindfulness-Based Interventions in Context: Past, Present, and Future. *Clinical Psychology: Science and Practice* (2). doi: 10.1093/clipsy. bpg016.
- [2] Hao Hailong. (2022). the intervention of mindfulness training on attention and self-concept of children aged 9-10 (Master's thesis, Hebei Normal University). <http://gffiy28995338bdc041dasx6p9ufcucncq606f. fffb. suse. cwkeji. cn:999>

- /KCMS/detail/detail.aspx?dbname=CMFD202202&filename=1022487773.nh
- [3] Wang Chengli, He Wen & Mo Qiongqiong. (2012). Characteristics of 7-15-year-old students' attention development and their relationship with academic performance. *Shanghai Education Research* (12), 51-54. doi:10.16194/j.cnki.31-1059/g4.2012.12.001.
- [4] J. David Creswell. (2017). Mindfulness Interventions. *Annual Review of Psychology* (1). doi:10.1146/annurev-psych-042716-051139.
- [5] Peng Danling. (2019). *General Psychology*. 5th Edition. Beijing: Beijing Normal University Press.
- [6] Chen Junxiong. (2022). the Intervention Research of Mindfulness Training on Primary School Students' Bad Attention Quality (Master's Dissertation, China West Normal University). detail.aspx?dbname=CMFDTEMP&filename=1022794928.nh
- [7] Ding Jinhong, Pan Fafa, Wang Yujuan & Chen Yi. (2012). the influence of attention on academic performance of pupils aged 9-13. *Jiaotong Medicine* (06), 569-572+579.
- [8] Jin Jianshui & Liu Xinghua. (2017). Mindfulness Education for Children and Adolescent Students--Exploration of Mindfulness as a New Method of Mental Health Education. *Journal of Capital Normal University (Social Science Edition)* (02), 170-180.
- [9] Cashin, AG, & McAuley, JH (2019). Clinimetrics: Physiotherapy Evidence Database (PEDro) Scale. *Journal of physiotherapy*, 66(1), 59-59. https://doi.org/10.1016/j.jphys.2019.08.005.
- [10] Eldar, S., Ricon, T., & Bar-haim, Y. (2008). Plasticity in attention: Implications for stress response in children. *Behavior Research & Therapy*, 46(4), 450-461.
- [11] Juan M. Guiote, Vanessa Lozano, Miguel Ángel Vallejo & BlancaMas. (2022). Autogenic Meditation Training in a Randomized Controlled Trial: a Framework for Promoting Mental Health and Attention Regulation in Children. *Revista De Psicodidáctica (english Ed.)*, 27, pp. 47-55. https://doi.org/10.1016/j.psicoe.2021.10.002. 10.1016/j.psicoe.2021.10.002.
- [12] Christian Müller, Barbara Otto, Viktoria Sawitzki, Priyanga Kanagalingam, Jens-Steffen Scherer & Sven Lindberg. (2021). Short Breaks at School: Effects of a Physical Activity and a Mindfulness Intervention on Children's Attention, Reading Comprehension, and Self-esteem *Interos. and Education*, 25, p. 100160. https://doi.org/10.1016/j.tine.2021.100160. 10.1016/j.tine.2021.100160.
- [13] Clemens CC Bauer, Liron Rozenkrantz, Camila Caballero, Alfonso Nieto-Castanon, Ethan Scherer, Martin R. West, Michael Mrazek, Dawa T. Phillips, John DE Gabrieli & Susan Whitfield-Gabrieli. (2020). Between Default-mode Network and Dorsolateral Prefrontal Cortex: a Randomized Controlled Trial. *Human Brain Mapping*, 41, pp. 5356-5369. https://doi.org/10.1002/hbm.25197. 10.1002/hbm.25197.
- [14] Cristiano Crescentini, Viviana Capurso, Samantha Furlan & Franco Fabbro. (2016). Mindfulness-oriented Meditation for Primary School Children: Effects on Attention and Psychological Well-being. *Frontiers in Psychology*, 7, pp. 1-2. http://dx.doi.org/10.3389/fpsyg.2016.00805. 10.3389/fpsyg.2016.00805.
- [15] Kristen E. Rawlett, Erika Friedmann & Sue A. Thomas. (2019). Mindfulness-Based Intervention with an Attentional Comparison Group in at Risk Young Adolescents: a Pilot Randomized Controlled Trial. *Integrative Medicine Research*, 8, pp. 101-106. https://doi.org/10.1016/j.imr.2019.04.002. 10.1016/j.imr.2019.04.002.
- [16] Ricardo Tarrasch. (2018). the Effects of Mindfulness Practice on Attentional Functions Among Primary School Children. *Journal of Child and Family Studies*, 27, pp. 2632-2642. http://dx.doi.org/10.1007/s10826-018-1073-9. 10.1007/s10826-018-1073-9. Measuring the effectiveness of a mindfulness intervention on attentional functioning in children (George Thomas) (English).
- [17] Antonio Baena-Extremera, María del Mar Ortiz-Camacho, Alba M. Marfil-Sánchez & Antonio Granero-Gallegos. (2021).

- Improvement of Attention and Stress Levels in Students Through a Mindfulness Intervention Program. *Revista De Psicodidáctica (english Ed.)*, 26, pp. 132-142. <https://doi.org/10.1016/j.psicoe.2020.12.002>.
- [18] Cheng Wenxiu. (2020). Research on Mindfulness Training Improves Adolescents' Attention_Cheng Wenxiu. [Master, Southeast University]. Southeast University. <https://kns.cnki.net/kcms/detail/detail.aspx?dbname=CMFD2022&filename=1021581875.nh&dbcode=CMFD.10.27014/d.cnki.gdnau.2020.002201>.
- [19] Xie Jing & Tu Yanguo. (2018). Research on the Effect of Mindfulness Education on Children's Development—Based on the Experiment of Mindfulness Education in the Fifth Grade of D Primary School in W City. *Education Research and Experiment*, (6), pp. 23-28. <https://kns.cnki.net/cms/detail/detail.aspx?dbname=CJFD2018&filename=YJSY201806005&dbcode=CJFD>.