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A Component of Mindfulness: Attention

Farkındalığın Bir Bileşeni: Dikkat

Çiğdem Gülden[1], İlhan Yalçın[2]

[1]Ministry of National Education, Ankara
[2]Ankara University, Ankara

ABSTRACT

The use of mindfulness-based interventions in many areas is increasing day by day. Having knowledge of the components of mindfulness is also important to know the mechanisms in which mindfulness-based interventions are effective. This study has aimed to examine potential attentional mechanisms of mindfulness. In this context, mindfulness has been defined and attention and attention models have been briefly discussed in the study. Then, the relationship between mindfulness and attention has been examined, and previous research findings examining mindfulness and attention are included. The studies on attention and mindfulness seem to have more inconsistent results when conducted with adults, whereas the studies in adolescents and children seem to have more consistent results revealing that mindfulness-based interventions improve the attentional skills of the youth. Knowing the relationship between mindfulness and attention will aid to maximize the efficacy of mindfulness-based interventions and it will be a crucial step in identifying the people that might benefit from mindfulness-based interventions

Keywords: Mindfulness, attention, attention models

ÖZ

Farkındalık temelli müdahalelerin, pek çok alanda kullanımı gün geçtikçe artmaktadır. Farkındalığın bileşenlerine ilişkin bilgiye sahip olmak, farkındalık temelli müdahalelerinin etkiliğindeki mekanizmaları bilmek için de önemlidir. Bu bağlamda, bu çalışmada farkındalığın ne olduğu açıklanmış, dikkat ve dikkat modelleri kısaca ele alınmıştır. Ardından, farkındalık ve dikkat arasındaki ilişki incelenmiş, farkındalık ve dikkati inceleyen önceki araştırma bulgularına yer verilmiştir. Dikkat ve farkındalığı konu alan çalışmalar, yetişkinlerle yapıldığında daha tutarsız sonuçlara işaret ederken; ergen ve çocuklarda yapılan çalışmaların daha tutarlı olduğu ve farkındalık temelli müdahalelerin çocuk ve ergenlerin dikkat becerilerini iyileştirdiği görülmektedir. Farkındalık ve dikkat arasındaki ilişkiyi bilmek, farkındalık temelli müdahalelerin etkililiğini en üst düzeye çıkarmaya yardımcı olacak ve farkındalık temelli müdahalelerden faydalanabilecek kişileri belirlemede önemli bir adım olacaktır.

Anahtar sözcükler: Farkındalık, dikkat, dikkat modelleri

Introduction

The ability to pay attention is essential for survival. From birth, people spend all their waking hours paying attention to competing stimuli. People are continually forced to pay attention to an infinite number of external and internal signals. The attention controls this input based on one's present capability and decreases the quantity of information that the brain must continually process (Parasuraman 1998, Polak 2009, Cohen 2014). Attention is central to learning and critically important for cognitive processing (LaBerge 1995). The youth who are unable to focus and sustain their attention are more likely to fail academically, whereas those who are able to focus and sustain their attention are more likely to succeed academically (Rabiner et al. 2004, Lyons and DeLange 2016). Attention is a crucial component of cognitive functioning (Posner and Petersen 1990). In addition to cognitive processing, understanding the function of attentional control may hold the key to understanding how psychological issues arise (Felver et al. 2016). Attentional control is a key factor in healthy emotional and behavioral functioning (Mathis et al 2019). Greater attention flexibility can support emotion regulation by separating irrelevant negative information more easily and paying attention to positive information more frequently. With increased attention to positive information, individuals more easily see reward opportunities in their environment and can learn to pay selective attention to certain types of information. Thus, their subjective well-being can increase (Wadlinger and Isaacowitz 2011). When individuals are good at regulating their attention, emotions and behavior, their social functioning is better (Kochanska et al. 2000). Attention problems can also affect social interactions with peers. Children who do not pay attention to social cues in their environment may have more difficulty in establishing and maintaining friendships

Address for Correspondence: Çiğdem Gülden, Ministry of National Education, Directorate General of Special Education and Guidance Services, Ankara, Türkiye **E-mail:** cigdemguldenn@hotmail.com
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compared to children who pay attention to and can react to social cues (Murphy et al. 2007). In addition, youths who have a great capacity to manage their attention are less vulnerable to deviant peer effects on problem conduct (Dishion et al. 2011).

Attentional control is a skill which can be taught and practiced (MacDonald and Olsen 2020). Attentional control is an important component of mindfulness practice because it requires active attention, which leads to awareness (Schmertz et al. 2009). Mindfulness practices help people train their minds so that their attention is consistent and concentrated (Lyons and DeLange 2016, Shapiro et al. 2016). Mindfulness can be learned and developed. Mindfulness may be fostered in the same way that physical fitness can be achieved through exercise (Blake 2013). Mindfulness-based interventions help individuals improve attention (Schonert-Reichl and Lawlor 2010, Thomas and Atkinson 2016, Suárez-Garca et al. 2020, Gülden 2022). Additionally, the studies of brain activity imaging in individuals with ADHD and brain activity following mindfulness-based intervention show that the same prefrontal regions are active (Giedd et al. 2001, Lazar et al. 2005). The studies examining the effectiveness of mindfulness-based interventions show that they have been helpful in reducing attention deficit hyperactivity symptoms (ADHD) (Chambers et al. 2008, Zylowska et al. 2008, Modesto-Lowe et al. 2015, Cairncross and Miller 2020 Oliva et al. 2021, Kretschmer 2022). In this context, exploring the mechanism between mindfulness and attention will aid in the development of mindfulness-based interventions and maximizing the benefits of mindfulness-based interventions.

This review aims to provide enlightening insights into the relationship between mindfulness and attention for mental health practitioners, educators, and researchers. Following information on mindfulness and attention, attention models will be provided in this context. The relationship between mindfulness and attention will next be examined. Finally, previous research findings examining mindfulness and attention will be presented.

Mindfulness

The term mindfulness derives from the eastern Buddhist tradition. Although it has strong origins in Buddhist psychology (Brown et al. 2007), it does not belong to any self-concept or philosophical point of view by definition. It does not fall under the authority of any philosophical school of thinking (Ryan and Rigby 2015). Mindfulness is inherently global, and its definition is not bound to a particular spiritual or theological context (Kabat-Zinn 2003). There are numerous definitions of mindfulness in western philosophy (Williams 2010). Kabat-Zinn (1994) defines mindfulness as “attentive, present, and nonjudgmental paying attention” (p.4) while Brown et al. (2007) define mindfulness as “a receptive attention and awareness towards current events and experiences” (p.212). Bishop et al. define it (2004 p.232) “every thought, emotion, or sensation that arises in the attention area is recognized and accepted as it is; it is a kind of effortless, non-judgmental, present-centered awareness.”

The focus of mindfulness meditation is on present-moment awareness of the constantly changing flow of internal and external stimuli. The focus of attention is on the now, not in the past or the future. The practitioners sustain their attention on a particular subject such as their breathing pattern during mindfulness meditation. It is performed by gradually widening the field of the object to include all physical and mental sensations that arise as a result of observation. When the practitioner's focus moves to other thoughts or feelings, one attempts to be aware and observe without judgment before gently returning their attention to their breath. It is natural for one’s mind to shift from the focus subject. Every time one’s mind wanders, the practitioner repeats the process (Baer 2003, Blake 2013). The distraction is as important as concentrated periods in mindfulness meditation. Equal attention is given to awareness of negative and positive thoughts and feelings (Kabat-Zinn 1990). In mindfulness practice, there is no such thing as a correct or bad experience. If the practitioner becomes bored, sleepy, or worried throughout the practice, it does not imply failure (Deci et al. 2015). All in all, mindfulness has been defined in various ways. It is seen that attention, awareness, being nonjudgmental and being at present are the common themes characterizing the mindfulness.

Attention

The aperture and lens system of a camera are analogous to attention. It helps people to orient themselves to the relevant features of external events or internal processes by shifting attention, depth of field, and focus. It promotes the selection of salient information and the allocation of suitable cognitive processes to that information. As a result, attention may be said to operate as a gate for the flow of information in the brain (Cohen 2014). Attentional control development starts at birth and continues until adolescence (Kar et al. 2011). Although the ability to pay attention is shared by all humans, there are differences in how excellent people are

at it. However, there is evidence that training may increase attention functioning and that environmental forces can have a major impact (Polak 2009).

Attention cannot be defined functionally (Edelstein 2016). According to Parasuraman (1998), there is no one definition of attention and no single complete theory that explains attention. There is no general agreement about the nature and components of attention in the field of attention (Müller et al. 2000, Treisman 2006). However, Posner and Petersen (1990) proposed a model of attention that included three different networks from other cognitive functions. Three attention networks were identified, both functionally and anatomically: alerting, orientation and executive control (Petersen and Posner 2012). The alerting network is about vigilance to approaching stimuli (Tang and Posner 2015) and it requires sustained attention (Blake 2013). The alerting is also defined as sustained attention. The purpose of the orienting network is to direct and limit attention to a subset of possible inputs (Jha et al. 2007). The orientation is defined selective attention (Posner 1994). The conflict monitoring which is the other attentional network is defined focused attention and is responsible for resolving conflicts that arise between competing stimuli. Posner and Petersen (1990) defines it as a spotlight that focuses attention on the relevant stimulus. Although there is some controversy regarding how much overlap and connection these subsystems have with one another, it appears that these three domains work as parts of the attentional subsystem (Blake 2013).

Corbetta and Shulman's (2002) endogenous/exogenous (top-down-bottom-up) is an extension of Posner and Petersen's (1990) Triple Attention Model. Attention control includes two attentional systems. The endogenous system is recognized as a voluntary system whose activation is dependent on cues indicating the perceptual and response qualities of the stimuli to which humans must pay attention. The exogenous system is considered as a warning mechanism that is activated when there are abrupt changes in sensory inputs. The first system is top-down and goal-oriented because it relates to existing knowledge, goals, and expectations. Endogenous attention is defined as a kind of attention that can be directed voluntarily. Using endogenous attention is optional. The second system is bottom-up and stimulus-focused (Corbetta and Shulman 2002). This is an example of the use of top-down, endogenous orientation when asked to shift attention from words on the page to sensations in the right hand. This type of voluntary attention differs from bottom-up, stimulus-focused attention. Bottom-up attention is activated when a strong or distinctive stimulus, such as a loud siren, attracts attention (Davis and Thompson 2015). When evaluated in terms of endogenous/exogenous processes, orientation and conflict monitoring are considered endogenous attention systems. Alerting represents the exogenous process (Corbetta and Shulman 2002).

As suggested in Corbetta and Shulman's (2002), Attentional Control Theory (Eysenck et al. 2007) suggests that there are two basic attention systems. The first is voluntary and goal-directed (top-down control of attention). The second is the second is involuntary and stimulus-focused (bottom-up control of attention) The relationship between anxiety and attention control is the topic of Attentional Control Theory (Eysenck et al. 2007). Attentional control has two components. These are focusing attention and shifting attention (Muris et al. 2007). The capacity to focus on a topic for a lengthy period of time while limiting distractions from irrelevant inputs in the surroundings is defined as attentional focusing. The capacity to alter attentional resources from one stimuli to another is defined as attentional shifting (Campbell 2016). According to Attentional Control Theory, anxiety disrupts the balance of goal-oriented and stimulus-focused attention systems (Eysenck et al. 2007). It is hypothesized that the balance between goal-driven and stimulus-driven systems is disrupted when an individual is anxious. The stimulus-driven processes become more active than goal-driven processes, and hence anxiety decreases attentional control (Derakshan and Eysenck 2009). As the effect on the target-oriented attention system decreases, the attention shifts to the salient input. It causes the attention to focus more on the salient stimulus and thus the stimulus is processed automatically (Campbell 2016). In sum, although there is no consensus agreement what the attention is and the components of attention, it seems that Endogenous/Exogenous Attention Model and Attentional Control Theory do not ignore the Triple Attention Model. In addition, the use of the terms interchangeably makes it difficult to understand the literature regarding attention.

Relationship between Mindfulness and Attention

Mindfulness is defined by Kabat-Zinn (2003) as "the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment," indicating that it is especially focused on attentional control. When the definitions of mindfulness in the literature are examined, it is seen that the word attention is used in almost all definitions (see: Kabat-Zinn 1994, Brown and Ryan 2003, Bishop et al. 2004, Carmody 2009, Dane 2010, Dreyfus 2013, Farb et al. 2014, Long and

Christian 2015). According to Tang and Posner (2015), all mindfulness explanations contain attention as a core element. Similarly, when Curtis (2019) investigated the definitions of mindfulness in studies which were done between 2015 and 2018, he discovered that the term most commonly used to characterize mindfulness by researchers was attention.

People are asked to direct their attention in mindfulness meditation to their current sensations, such as their breath or numerous elements in their environment (Kabat-Zinn 1994). The attentional component of mindfulness is the discipline of focusing one's attention to specific sensations or details. Mindfulness requires not only directing one's attention, but also giving one's attention to the task at hand (Fey 2019). These are shifting and focusing attention which are the components of attention control. People's attention may be narrowed by focusing on a specific stimulus, or it can be broadened by paying attention to different stimuli around them. Because mindfulness encourages people to focus their attention on the present moment, expanding or restricting attention is a component of mindfulness-based interventions (Fey 2019). Mindfulness training might be considered an informal training in attention skills (Verhaeghen 2021) but they are different because individual practicing mindfulness focuses on both self-awareness and mind wandering as well as the meditation subject (Gunaratana 1996). Even if someone manages to clear the mind of conscious distractions, some background attention must always be present when they meditate, so it would be misleading to say that mindfulness is a state of unalloyed attention or total control over one's attention (Edelstein 2016).

Mindfulness Meditation Training and Attention

Focused attention meditation that is one of the mindfulness meditation training entails the capacity to maintain focus on an object for progressively longer periods of time. Focus must be maintained while meditators resist the urge to pay attention to unwanted thoughts, anxieties, or outside stimuli (Sumantry and Stewart 2021). FA meditation requires the meditator to cultivate both controlled and sustained attention (Verhaeghen 2021). The practice of FA meditation is closely linked to endogenous attentional control, as it requires the attention to be voluntarily focused on a selected object and then returning one's attention to the chosen object (Edelstein 2016). Lutz et al. (2008) state that FA practice improves three attention skills. They state that it requires directing attention to a selected object and maintaining attention on the selected object, shifting the mind and detecting distracting elements, separating the attention from the distracting elements and bringing it back to the selected object.

Open monitoring which is one of the mindfulness meditation training involves watching the content of the experience moment by moment without response. There is no explicit focus on objects. In open monitoring meditation, the meditator often focuses her awareness on any sensation, thought, or feeling that emerges. There are no sharp borders between events, and attention shifts are not based on any obvious indications (Verhaeghen 2021). OM meditation encourages building the ability to stay in the present moment, concentrating attention on different parts of experience while keeping the mind from being overly absorbed with thought (Sumantry and Stewart 2021). OM entails nonreactive meta-cognitive monitoring, nonreactive awareness of automatic cognitive and emotional interpretations of sensory, perceptual and endogenous stimuli (Lutz et al. 2008). The resemblance to endogenous attention is remarkable. In conclusion, exogenous and endogenous attention are obviously connected to the abilities learned via mindfulness meditation (Edelstein 2016). Chiesa et al. (2011) executed a systematic review based on the Posner and Petersen (1990) attentional networks to investigate the neuropsychological outcomes of mindfulness meditation. Based on the findings of many investigations, the authors concluded that mindfulness meditation enhanced the alerting, orienting, and executive control networks.

Mindfulness and the Alerting Network

Bishop et al. (2004) state that the development of mindfulness is directly related to the development of sustained attention because it requires sustained attention. It demands care to keep the attention rooted in the present moment (Strisssel 2019). Chambers et al. (2008) has shed light on how mindfulness meditation techniques may affect the alerting network. They found that mindfulness participants in a 10-day meditation retreat performed much better on a test of sustained attention than a control group. The participants' sustained attention was assessed using the Internal Switching Task. Results showed that whereas the reaction durations of the control group did not substantially change with time, those of the mindfulness group considerably decreased from time one to time two. Bauer et al. (2020) investigated the effects of a school-based program on sustained attention. Over the course of eight weeks, the program aimed to teach students how to pay attention intently and to shift their perspective on stress. Coding training was given to control group. Both before and

after training, sustained attention was assessed. According to Bauer et al (2020) sixth-grade students' sustained attention was improved in some areas by the mindfulness program.

Similarly, the effectiveness of Mindfulness-Based Stress Reduction (MBSR) in improving sustained attention was investigated by Tarrasch et al. (2018) in youth between the ages of 8 and 11. Individuals were randomized to receive either passive control or mindfulness training. Ten group sessions of MBSR were given to the training group. Pre- and post-tests to evaluate sustained attention were conducted on both groups. According to Tarrasch et al. (2018), mindfulness training can enhance sustained attention. Another study revealed that meditation training for four days could enhance the ability to sustain attention (Zeidan et al. 2010). Further studies comparing those who did mindfulness meditation with those who did not, or who did less revealed that meditators had better sustained attention (Valentine and Sweet 1999, Jha et al. 2007, Josefsson and Broberg 2011). On the other hand, further study has found no significant changes in sustained attention between meditators and control groups (Tang et al. 2007, Polak 2009). In sum, although there are few studies indicating no change in alerting network after mindfulness based interventions or mindfulness training, most of the studies show that mindfulness based interventions enhance the sustained attention.

Mindfulness and the Orienting Network

Mindfulness requires people not only to maintain their focus on the task at hand, but also to orient their attention (Fey 2019). The broad allocation of attentional resources toward the perception of stimuli is referred to as orienting to sensory stimuli. Which of these stimuli is thus more pertinent, fascinating, or relevant is indicated by our attentional system. Following the identification of stimuli as pertinent, the attentional system must maintain awareness toward those stimuli (Posner and Petersen 1990). Since mindfulness teaches people to concentrate their attention on the present moment, widening or narrowing of attention is an inherent part of mindfulness-based interventions (Kabat-Zinn 1994). Tasks involving spatial attention, in which attention is focused on a specific geographic area either by goal-driven activity or unanticipated prominence of the stimuli, are frequently used in assessments of orientation (Prakash et al. 2020).

Studies have offered some data suggesting that practicing mindfulness may affect one's capacity for selective attention. Chan and Woollacott (2007) assessed selective attention in meditators and control individuals. Participants are asked to read letters made up of numerous tiny letters and following that, participants are required to evaluate either the huge letter or the little letter which makes up the larger letter. The results demostrated that while the congruency impact score and meditation practice did not significantly correlate, the experience of meditation was related with considerably quicker response times in the overall condition. Becerra et al. (2017) investigated the effects of mindfulness training on university students. Mindfulness training was implemented once every 2 weeks for eight weeks. The attention skills of the participants were measured by using Attention Network Test (ANT). Better orientation was demonstrated by the mindfulness training group compared to wait-list. Similarly, Moore and Malinowski (2009) discovered a relationship between prior meditation practice and selective attention skills. Jensen et al. (2012) found that after the MBSR training, there was a significant improvement in the orienting and shifting attention skills of the participants. However, Anderson et al. (2007) found that there was no improvement in the same attention skills of the participants in the experimental and control groups after MBSR training. All in all, although the most previous studies suggest that mindfulness-based interventions may enhance orienting the attention, more studies are needed to understand the relationship between mindfulness and selective attention.

Mindfulness and Executive Attention

Conflict monitoring, the last attention component, is identifying and resolving rivalry between dominant and nondominant reactions (Petersen and Posner 2012). Bishop et al. (2004) cite executive attention or switching abilities as another essential element of mindfulness in addition to sustained attention. Because mindfulness practice contains noticing the attention has wandered from the target stimuli and redirecting attention back to the target, executive attention is a requirement for mindfulness. The conflict component of the ANT and the Stroop task are two often used measures of conflict monitoring in the mindfulness research (Prakash 2020). Wenk-Sormaz (2005) investigated whether mindfulness may be utilized as an efficent method to minimize habitual responses, or to improve executive performance. Participants were randomly allocated to one of three attention categories: mindfulness, learning, or rest, and their executive attentional functioning was measured both before and after intervention. Participants in the mindfulness group made to meditation for 20 minutes. Before the training, between groups, there were no significant changes; nevertheless, following mindfulness training, the condition produced much fewer interference mistakes than either of the control groups. Similarly,

Tang et al. (2007) used the ANT to assess executive attention and found that the mindfulness group after a brief mindfulness training improved their conflict scores more. In other words, the executive attention scores of the mindfulness group were significantly higher compared to those of the control group. Over the course of eight days, Ainsworth et al. (2013) saw gains following just three one-hour sessions of either focused attention or open monitoring techniques. Similarly, it has been shown that mindfulness-based interventions improve executive attention (Slagter et al. 2007, Zeidan et al. 2010, Moore et al. 2012). Other studies, however, have found no increase in the executive attention capacities of healthy individuals after meditation training (Anderson et al. 2007, Polak 2009). In conclusion, after brief interventions, it indicates that executive attention networks may be altered by mindfulness-based therapies; however, further research is required to completely comprehend the relationship and the underlying mechanisms (Clawson 2019).

Mindfulness as an Emotion Regulation Tool

Attention naturally shifts to emotionally salient objects in the environment. Not only external emotional cues, such as a hissing snake, attract attention but also internal emotional cues can direct attention to certain objects (Huntsinger 2013). In cognitive science and neuroscience, the link between attention and emotion has been researched (see: Vuilleumier 2005, Pessoa 2009). Emotional experiences catch attention quickly and spontaneously by stimulating subcortical brain circuits (Zikopoulos and Barbas 2012). Emotional stimuli, including shifting attention or activating executive mechanisms can have a negative impact on the functioning of attention processes. The introduction of emotional cues causes the orienting and executive networks to act slower (Cohen et al. 2015). Similarly, Attention Control Theory suggests that anxiety affects attention performance. The negative effects of anxiety on performance increase, especially when tasks are complex or require attention (Eysenck 2002). Practicing mindfulness requires people to keep an eye on their focus and direct it toward current events rather than allowing their thoughts to wander to the past or the future (Reina and Kudesia 2020). To be aware of one's emotional state, attention must be directed toward one's consciousness in the present moment (Ballantyne 2012). Mindfulness practices allow people to focus on their inner world and then change it in a healthy way (Siegel et al. 2016).

The mind constantly labels all lived experiences, categorizes them, and usually places each experience in a category such as good or bad. The habit of categorizing and judging experiences prevents people from seeing their thoughts objectively (Kabat-Zinn 1990). Nonjudgment is one of the important component of mindfulness. Nonjudgment refers to the ability to detect when one's attention is drawn to cognitive and emotional triggers associated with experience and to counteract this instinctive tendency by purposefully examining the experience without preconceptions or reflexive self-judgment (Broderick and Metz 2016). Feelings, thoughts and body sensations should not be judged, but only watched. The judgment process of the mind itself should be monitored so that the mind can see more clearly (Segal et al. 2002). Being aware of what is going on inside and outside of oneself improves attention skills (Parker and Kupersmidt 2016). When observing skills are developed, the mind is balanced to see more deeply, clearly and in detail (Siegel et al. 2016). Learning to observe and recognize physiological, cognitive and emotional cues improves the ability to focus attention (Parker et al. 2015). Mindfulness practices can help practitioners be more conscious and better cope with negative emotions (Parker and Kupersmidt 2016).

Emotions are like energy fluctuations and can be overcome by paying attention to them and watching them come and go (Broderick 2013). Mindfulness requires that individuals keep track of their thoughts and emotions in relation to these ongoing events from a more detached perspective, in which they step back mentally rather than becoming involved in them (Reina and Kudesia 2020). The ability to step back or maintain psychological distance from one's experience, particularly one's thoughts and emotions, rather than fusing with it, is a crucial component of mindful emotion regulation (Crane et al. 2017). Being aware of emotions and being able to look at them from a distance is an emotion regulation skill (Napoli et al. 2005). It has been discovered that both FA and OM promote emotional regulation (Lohani et al. 2020). Previous studies also support the positive relationship between mindfulness and emotion regulation (Shapiro et al. 2007, Kuyken et al. 2013, Demir 2015, Felver et al. 2016, Demir 2017, Demir and Gündoğan 2018, Özdemir 2020, Li et al. 2021, Gülden 2022, Portele and Jansen 2023, Zhang and Zhang 2023). In sum, emotional stimuli may have effect on the efficiency of attentional process. By practicing mindfulness, individuals do not judge experiences, they can pay attention to their inner selves and be aware of internal events and observe their emotions from a distance. These are included in the emotion regulation skills. By enhancing emotion regulation, mindfulness aids in the development of attentional control.

Current Research on Mindfulness and Attention

When the studies conducted with adults examining attention and mindfulness are evaluated in general, it is seen that some of the studies provided inconclusive findings in nonclinical population. Hertz (2018) found that the attention levels of the participants increased after the online mindfulness-based intervention. In the meta-analysis study, Verhaeghen (2021) discovered that mindfulness trainings improved focused attention within mindfulness intervention studies. The study by Moore et al. (2012) demonstrated that mindfulness meditation may increase attention self-regulation by altering the efficiency with which cognitive resources were allocated. Fagioli et al. (2023) discovered that a brief mindfulness-based intervention led to increase in participants' self-regulation of attention. However, no improvement in the executive attention capacity of adults following meditation training was been reported (Anderson et al. 2007, Polak 2009). The studies conducted with ADHD individuals reveal that mindfulness training may have positive effects. Smalley et al. (2009) revealed that mindfulness is negatively associated ADHD. The study by Gu et al. (2017) conducted with undergraduates with ADHD demonstrated that participants receiving MBCT group showed greater treatment response rates compared to the control group. Bueno et al. (2015) investigated the effects of a 8 week mindfulness-based intervention on adults with ADHD. The results demonstrated that mindfulness-based intervention enhanced sustained attention of the participants. Similarly, Cairncross and Miller (2020 examined the effectiveness of mindfulness-based interventions in ADHD by providing a review of the research. The findings of this study emphasize the potential advantages of mindfulness based interventions in lowering ADHD symptoms.

The studies that examine the relationship between mindfulness training and attention in children and adolescents revealed that mindfulness-based interventions had generally positive effect on their attentional skills compared to the studies conducted with adults. According to a research by Wisner (2014), adolescents who took part in a mindfulness program offered in their schools revealed an improvement in their capacity for paying attention. The study with adolescents by Gülden (2022) also investigated the effects of a 8 week mindfulness-based program on their attention control. Findings revealed that the attention control levels of the adolescents in the experimental groups increased compared to the adolescents in the control groups. In order to assess the efficacy of mindfulness education, Schonert-Reichl and Lawlor (2010) carried out a research with kids who had a mean age of 11.4 years. Results from the teacher-rated scale showed that compared to the students in the control group, the students who received mindfulness-based intervention performed better attention and concentration. Another study explored the relationships between working memory, attention, and trait mindfulness in junior school children whose ages ranged from 9 to 15 (Li et al. 2021). The findings indicated that trait mindfulness, attention, and working memory had favorable associations. For kids between the ages of 9 and 13, Semple et al. (2010) assessed the results of mindfulness-based cognitive therapy. In comparison to wait-listed controls, children who finished the program had less attention problems. The effects of a mindfulness-based intervention on attention were studied by Suárez-Garca et al. (2020) on a sample of third-year primary school students. According to instructors' reports, the outcomes showed that the intervention program had a beneficial impact on the decline in children' attention issues. Napoli et al. (2005) found that youths between the ages of 7-10 who engaged in mindfulness practice training showed an increase in selective attention. Thomas and Atkinson (2016) carried out a quasi-experimental design research to assess the effects of a mindfulness program among children between the ages of eight and nine. The findings of this study revealed that there is a relationship between children's mindfulness and attention. Zylowska et al. (2008) demonstrated that mindfulness training program might reduce ADHD and comorbid pathology in adolescents. Aboalola (2023) aimed to determine if a mindfulness-based intervention may help young children with ADHD by enhancing executive functioning (EF) and lowering its symptoms. After mindfulness-based intervention, there were statistical differences in EF and in ADHD.

Conclusion

In this study, mindfulness and attention have been explained and the relationship between them has been examined. The concept of attention is a complex construct. It consists of various networks, such as executive attention, alerting, and orienting, and is also defined in terms of how it is managed. The practice of mindfulness by an individual may be seen as a sort of informal attention training, but it differs from this since it focuses on both self-awareness and mind wandering in addition to the meditation subject. Two types of mindfulness meditation training are distinguished. These are focused attention and open monitoring. The skills acquired via mindfulness meditation are related to exogenous and endogenous attention. It is suggested that FA practice improves three attention skills. It entails focusing attention on a chosen item and keeping it there, shifting the mind and identifying distracting factors, disconnecting the attention from the factors and returning it to the chosen object. During OM, decentering is cultivated. Attention skills are enhanced by being aware of both

internal and external factors. The capacity to concentrate attention is enhanced through training in the observation and recognition of physiological, cognitive, and emotional signs. Based on the results of many studies, the researchers came to the conclusion that mindfulness meditation improved the alerting, orienting, and executive control networks. Besides exterior emotional cues, internal emotional signals can draw attention to certain items. Attentional processes may be negatively impacted by emotional inputs. Mindfulness also contributes to the development of attentional control by improving emotion control.

To briefly evaluate the studies in the literature, although it is seen that the studies examining the relationship between mindfulness and attention conducted with adults show improvements in the attentional skills of individuals participating in mindfulness training, some studies seem to provide mixed findings. The duration and quality of the mindfulness-based intervention used in the research can be a reason for inconclusiveness in research findings. Other explanations can be that there may be deficiencies in the method of the research and inconsistencies in the measurement tools used in the research. The characteristics of the developmental period of the participants in the studies can also be an explanation. Contrary to the studies with adults, the studies examining mindfulness and attention in children and adolescents seem to draw more attention to positive effects. The fact that that the brain is malleable (Huttenlocher 2009) and attentional control skills grow over childhood and adolescence (Kar et al. 2011) helps explain these findings. However, further studies with adults and youths researching mindfulness and attention using standardized mindfulness-based programs are required for a deeper understanding. Additionally, the findings of the studies on ADHD emphasize the potential advantages of mindfulness based interventions in lowering ADHD symptoms. Even though recent studies suggested that mindfulness based interventions may be a potential solution, further study is required before evaluating their efficacy in treating ADHD (Zhang et al. 2021). It is believed that mindfulness based interventions can be used to supplement rather than replace other active interventions (Oliva et al. 2021).

In conclusion, exploring the connection between mindfulness and attention provides valuable insights for mental health professionals, educators, and researchers. Grasping the relationship between mindfulness and attention is crucial for optimizing the effectiveness of mindfulness-based interventions. It is evident that mindfulness practices have the potential to improve individuals' attentional skills. Nonetheless, additional research on the correlation between attention and mindfulness will further contribute to the growing body of evidence regarding the effectiveness of mindfulness in enhancing attentional skills.

References

Aboalola AN (2023) The effectiveness of a mindfulness-based intervention on improving executive functions and reducing the symptoms of attention deficit hyperactivity disorder in young children. Appl Neuropsychol Child, doi: 10.1080/21622965.2023.2203321.

Ainsworth B, Eddershaw R, Meron D, Baldwin DS, Garner M (2013) The effect of focused attention and open monitoring meditation on attention network function in healthy volunteers. Psychiatry Res, 210:1226-1231.

Anderson ND, Lau MA, Segal ZV, Bishop SR (2007) Mindfulness-based stress reduction and attentional control. Clin Psychol Psychother, 14:449–463.

Baer R (2003) Mindfulness training as a clinical intervention: a conceptual and empirical review. Clin Psychol, 10:125-143.

Ballantyne EC (2012) The neuropsychology of mindfulness: attentional aspects (Doctoral dissertation). Chicago, IL, Adler School of Professional Psychology.

Bauer CCC, Rozenkrantz L, Caballero C, Nieto-Castanon A, Scherer E, West MR, Mrazek M et al. (2020) Mindfulness training preserves sustained attention and resting state anticorrelation between default-mode network and dorsolateral prefrontal cortex: A randomized controlled trial. Hum Brain Mapp, 41:5356-5369.

Becerra R, Dandrade C, Harms C (2017) Can specific attentional skills be modified with mindfulness training for novice practitioners? Curr Psychol, 36:657–664.

Bishop SR, Lau M, Shapiro S, Carlson L, Anderson ND, Carmody J et al. (2004) Mindfulness: a proposed operational definition. Clin Psychol, 11:230–241.

Blake SG (2013) Including and investigation of the relationship between mindfulness and attentional control (Doctoral dissertation). Surrey, UK, University of Surrey.

Broderick PC (2013). Learning to Breathe A Mindfulness Curiculum For Adolescents to Cultivate Emotion Regulation, Attention and Performance. Oakland, New Harbinger Publications.

Broderick PC, Metz SM (2016) Working on the inside: Mindfulness for adolescents. In Handbook of Mindfulness in Education: Integrating Theory and Research into Practice. (Eds KA Schonert-Reichl, RW Roeser):355-382. New York, Springer.

Brown KW, Ryan RM (2003) The benefits of being present: mindfulness and its role in psychological well-being. J Pers Soc Psychol, 84:822-848.

Brown KW, Ryan RM, Cresswell JD (2007) Mindfulness: theoretical foundations and evidence for its salutary effects. Psychol Inq, 18:211-237.

Bueno VF, Kozasa EH, Silva MA, Alves TM, Louzã MR, Pompéia S (2015) Mindfulness meditation improves mood, quality of life, and attention in adults with attention deficit hyperactivity disorder. Biomed Res Int, 2015:962857.

Cairncross M, Miller CJ (2020) The effectiveness of mindfulness-based therapies for ADHD: A meta-analytic review. J Atten Disor, 24:627-643.

Campbell M (2016) Exploring the relationship between attentional control, attentional bias, and anxiety in children (Master's thesis). Gainesville, FL, University of Florida.

Carmody J (2009). Evolving conceptions of mindfulness in clinical settings. J Cogn Psychother, 23:270-280.

Chambers R, Lo BCY, Allen NB (2008) The impact of intensive mindfulness training on attentional control, cognitive style and affect. Cognitive Ther Res, 32:303-322.

Chan D, Woollacott M (2007) Effects of level of meditation experience on attentional focus: is the efficiency of executive or orientation networks improved? J Altern Complement Med, 13:651-657.

Chiesa A, Calati R, Seretti A (2011) Does mindfulness training improve cognitive abilities? a systematic review of neuropsychological findings. Clin Psychol Rev, 31:449-464.

Clawson AJ (2019) Understanding the relation between mindfulness-based interventions, reading and attention (Master's thesis). New York, Syracuse University.

Cohen RA (2014) The Neuropsychology of Attention, 2nd ed. London, Springer.

Cohen N, Mor N, Henik A (2015) Linking executive control and emotional response: a training procedure to reduce rumination. Clin Psychol Sci, 3:15–25.

Corbetta M, Shulman GL (2002) Control of goal-directed an stimulus-driven attention in the brain. Nat Rev Neurosci, 3:201-215.

Crane RS, Brewer J, Feldman C, Kabat-Zinn J, Santorelli S, Williams JM et al. (2017) What defines mindfulness-based programs? the warp and the weft. Psychol Med, 47:990-999.

Curtis M (2019) An exploratory thematic analysis of mindfulness definitions, test instruments, and methods used in current research (Doctoral dissertation). Chandler, AZ, Ashford University.

Dane E (2010) Paying attention to mindfulness and its effects on task performance in the workplace. J Manage, 37:997-118.

Davis JH, Thompson E (2015) Developing attention and decreasing affective bias towards a cross-cultural cognitive science of mindfulness. In Handbook of Mindfulness Theory, Research and Practice. (Eds KW Brown, RM Ryan): 42-62. New York, Guilford Press.

Deci EL, Ryan RM, Schultz PP, Niemiec CP (2015) Mindfulness and interest taking within self-determination theory. In Handbook of Mindfulness Theory, Research and Practice. (Eds KW Brown, RM Ryan):112-130. New York, Guilford Press.

Demir V (2015) Bilinçli farkındalık temelli kognitif terapi programının bireylerin depresif belirti düzeyleri üzerine etkisi. Psikoloji Çalışmaları, 35:15-26.

Demir V (2017) Bilinçli farkındalık temelli bilişsel terapi programının üniversite öğrencilerinin kaygı düzeylerine etkisi. Uluslararası Toplum Araştırmaları Dergisi, 7:98-118.

Demir V, Gündoğan N (2018) Bilinçli farkındalık temelli bilişsel terapi programının üniversite öğrencilerinin duygu düzenleme güçlüklerini azaltmadaki etkisi. Ege Eğitim Dergisi, 19:46-66.

Derakshan N, Eysenck MW (2009) Anxiety, processing efficiency, and cognitive performance: new developments from attentional control theory. Eur Psychol, 14:168–176.

Dishion TJ, Felver-Gant JC, Abdullaev Y, Posner MI (2011) Self-regulation and adolescent drug use: Translating developmental science and neuroscience into prevention practice. In Inhibitory Control and Drug Abuse Prevention. (Eds M Bardo, D Fishbein, R Milich):281-301. New York, Springer.

Dreyfus G (2013) Is mindfulness present-centred and non-judgmental? A discussion of the cognitive dimensions of mindfulness. In Mindfulness Diverse Perspectives on Its Meaning, Origins and Applications. (Eds MG Williams, J Kabat-Zinn):41-54. New York, Taylor and Francis.

Edelstein J (2016) Attentional control: strategies for structuring (Master's thesis). Merced, CA, University of California Merced.

Eysenck MW (2002) Why do stressors impair performance? Psyc Critiques, 47:667-669.

Eysenck MW, Derakshan N, Santos R, Calvo MG (2007) Anxiety and cognitive performance: attentional control theory. Emotion, 7:336-353.

Fagioli S, Pallini S, Mastandrea S, Barcaccia B (2023) Effectiveness of a brief online mindfulness-based intervention for university students. Mindfulness, 14:1234-1245.

Farb N, Anderson A, Irving JA, Segal ZV (2014) Mindfulness interventions and emotion regulation. In Handbook of Emotion Regulation. (Ed JJ Gross):548-567. New York, Guilford Press.

Felver JC, Celis-De Hoyos CE, Tezanos K, Singh NN (2016) A systematic review of mindfulness-based interventions for youth in school settings. Mindfulness, 7:34–45.

Fey M (2019) Components of mindfulness training: impacts on attention and affect. (Master's thesis). Fayetteville, AR, University of Arkansas.

Giedd JN, Blumenthal J, Molloy E, Castellanos FX (2001) Brain imaging of attention deficit/hyperactivity disorder. Ann N Y Acad Sci, 931:33-49.

Gu Y, Xu G, Zhu Y (2018) A randomized controlled trial of mindfulness-based cognitive therapy for college students with ADHD. J Atten Disord, 22:388–399.

Gunaratana BH (1996). Mindfulness in Plain English, 2nd Ed. Somerville, MA. Wisdom Publications.

Gülden Ç (2022) Farkındalık temelli psikoeğitim programının ergenlerin dikkat kontrol ve farkındalık düzeylerine etkisi (Doktora tezi). Ankara, Ankara Üniversitesi.

Hertz ID (2018) The impact of online mindfulness based interventions on employee attention and mindfulness levels in the workplace (Master's thesis). Malibu, CA, Pepperdine University.

Huntsinger JR (2013) Does emotion directly tune the scope of attention? Curr Dir Psychol Sci, 22:265–270.

Huttenlocher PR (2009) Neural Plasticity: The Effects of Environment on The Development of The Celebral Cortex. Cambridge, Harvard University Press.

Jensen CG, Vangkidle S, Frokjaer V, Hasselbalch SG (2012) Mindfulness training affects attention – or is in attentional effort? J Exp Psychol Gen, 141:106-123.

Jha AP, Krompinger J, Baime MJ (2007) Mindfulness training modifies subsystems of attention. Cogn Affect Behav Neurosci, 7:109–119.

Josefsson T, Broberg A (2011) Meditators and non-meditators on sustained and executive attentional performance. Ment Health Relig Cult, 14:291–309.

Kabat-Zinn J (1990) Full Catasrophe Living: Using The Wisdom of Your Body and Mind to Face Stress, Pain, and Ilness. New York, Delta Trade.

Kabat-Zinn J (1994) Wherever You Go, There You Are: Mindfulness Meditation For Everyday Life. London, Piatkus.

Kabat-Zinn J (2003) Mindfulness-based interventions in context: past, present, and future. Clin Psychol-Sci Pr, 10:144–156.

Kar BR, Rao SL, Chandramouli BA, Thennarasu K (2011) Growth patterns of neuropsychological functions in Indian children. Front Psychol, 2:240.

Kretschmer CR, Göz Tebrizcik B, Dommett EJ (2022) Mindfulness interventions for Attention Deficit Hyperactivity 2 Disorder: a systematic review and meta-analysis. Psychiatry Int, 3:363-399.

Kochanska G, Murray KT, Harlan ET (2000) Effortful control in early childhood: continuity and change, antecedents, and implications for social development. Dev Sci, 36:220-232.

Kuyken W, Weare K, Ukoumunne OC, Vicary R, Motton N, Burnett R et al. (2013) Effectiveness of the mindfulness in schools programme: non-randomised controlled feasibility study. Br J Psychiatry, 203:126–131.

LaBerge D (1995) Attentional Processing: The Brain's Art of Mindfulness. Cambridge, Harvard University Press.

Lazar SW, Kerr CE, Wasserman RH, Gray JR, Greve DN, Treadway MT et al. (2005) Meditation experience is associated with increased cortical thickness. Neuroreport, 16:1893–1897..

Li Y, Yang N, Zhang Y, Xu W, Cai L (2021) The relationship among trait mindfulness, attention, and working memory in junior school students under different stressful situations. Front Psychol, 12:558690.

Lohani M, McElvaine K, Payne B, Mitcheom K, Britton W (2020) A longitudinal training study to delineate the specific causal effects of open monitoring versus focused attention techniques on emotional health. Complement Ther Med, 53:102525..

Long EC, Christian MS (2015) Mindfulness buffers retaliatory responses to injustice: a regulatory approach. J Appl Psychol, 5:1409–1422.

Lutz A, Slagter HA, Dunne J, Davidson RJ (2008) Attention regulation and monitoring in meditation. Trends Cogn Sci, 12:163-169.

Lyons KE, DeLange J (2016) Mindfulness matters in the classroom: the effects of mindfulness training on brain development and behavior in children and adolescents. In Handbook of Mindfulness in Education: Integrating Theory and Research into Practice. (Eds KA Schonert-Reichl, RW Roeser):271-283. New York, Springer.

MacDonald HZ, Olsen A (2020) The role of attentional control in the relationship between mindfulness and anxiety. Psychol Rep, 3:759-780.

Mathis ET, Dente E, Biel M (2019) Applying mindfulness-based practices in child psychiatry. Child Adolesc Psychiatr Clin N Am, 2:209-220.

Modesto-Lowe V, Farahmand P, Chaplin M, Sarro L (2015) Does mindfulness meditation improve attention in attention deficit hyperactivity disorder? World J Psychiatry, 4:397–403.

Moore A, Gruber T, Derose J, Malinowski P (2012) Regular, brief mindfulness meditation practice improves electrophysiological markers of attentional control. Front Hum Neurosci, 6:18.

Moore A, Malinowski P (2009) Meditation, mindfulness and cognitive flexibility. Conscious Cogn, 1:176-86.

Muris P, Meesters C, Rompelberg L (2007) Attention control in middle childhood: relations to psychopathological symptoms and threat perception distortions. Behav Res Ther, 45:997–1010.

Napoli M, Krech PR, Holley LC (2005) Mindfulnes training for elementary school students: The attention academy. J Appl Sch Psychol, 21:99–125.

Oliva F, Malandrone F, di Girolamo G, Mirabella S, Colombi N, Carletto S, Ostacoli L (2021) The efficacy of mindfulness-based interventions in attention-deficit/hyperactivity disorder beyond core symptoms: a systematic review, meta-analysis, and meta-regression. J Affect Disord, 1:292:475-486.

Özdemir B (2020) Mindfulness temelli stres azaltma (MBSR) programı'nın bilişsel ve duygusal süreçlere etkisi: Bilinçli farkındalık, duygulanım ve algılanan stres değişimi (Yüksek lisans tezi). Ankara, Ufuk Üniversitesi.

Parasuraman R (1998) The attentive brain: Issues and prospects. In The Attentive Brain. (Ed R Parasuraman):3-17. London, UK, MIT Press.

Parker AE, Kupersmidt JB (2016) Two universal mindfulness education programs for elementary and middle-school students: master mind and moment. In Handbook of Mindfulness in Education: Integrating Theory and Research into Practice (Eds KA Schonert-Reichl, RW Roeser):335-355. New York, Springer.

Parker SC, Nelson BW, Epel ES, Siegel DJ (2015) The science of presence: A central mediator of the interpersonal benefits of mindfulness. In Handbook of Mindfulness: Theory, Research, And Practice (Eds KW Brown, JD Creswell, RM Ryan):225–244. New York, Guilford Press.

Pessoa L (2009) How do emotion and motivation direct executive control? Trends Cogn Sci, 13:160-6.

Petersen SE, Posner M (2012) The attention system of human brain: 20 years after. Annu Rev Neurosci, 35:73-89.

Polak E (2009) Impact of two sessions of mindfulness training on attention (Doctoral dissertation). Coral Gables, FL, University of Miami.

Portele C, Jansen P (2023) The effects of a mindfulness-based training in an elementary school. Mindfulness, 14:830-840.

Posner MI (1994) Attention: the mechanisms of consciousness. Proc Natl Acad Sci U S A, 91:7398-7403.

Posner MI, Petersen SE (1990) The attention system of the human brain. Annu Rev Neurosci, 13:25-42.

Prakash RS, Fountain-Zaragoza S, Kramer AF, Samimy S, Wegman J (2020) Mindfulness and attention: current state-of-affairs and future considerations. J Cogn Enhanc, 4:340-367.

Rabiner DL, Murray DW, Schmid L, Malone PS (2004) An exploration of relationship between ethnicity, attention problems, and academic achievement. School Psych Rev, 33:498-509.

Reina CS, Kudesia RS (2020) Wherever you go, there you become: How mindfulness arises in everyday situations. Organ Behav Hum Decis Process, 159:78–96.

Ryan RM, Rigby CS (2015) Did the Budha have a self? No self, self, and mindfulness in buddhist thought and western psychologies. In Handbook of Mindfulness Theory, Research and Practice (Eds KW Brown, JD Creswell, RM Ryan):245-265. New York, Guilford Press.

Schmertz SK, Anderson PL, Robins DL (2009) The relation between self-report mindfulness and performance on tasks of sustained attention. J Psychopathol Behav Assess, 31:60–66.

Schonert-Reichl KA, Lawlor MS (2010) The effects of a mindfulness-based education program on pre- and early adolescents' well-being and social and emotional competence. Mindfulness, 1:137–151.

Segal ZV, Williams JMG, Teasdale JD (2002) Mindfulness-Based Cognitive Therapy For Depression: A New Approach to Preventing Relapse. New York, Guilford Press.

Semple RJ, Lee J, Rosa D, Miller LF (2010) A randomized trial of mindfulness-based cognitive therapy for children: promoting mindful attention to enhance social-emotional resiliency in children. J Child Fam Stud, 19:218–229.

Shapiro SL, Brown KW, Biegel GM (2007) Teaching self-care to caregivers: Effects of mindfulness-based stress reduction on the mental health of therapists in training. Train Educ Prof Psychol, 1:105–115.

Shapiro S, Rechtschaffen D, Sousa S (2016) Mindfulness training for teachers. In Handbook of Mindfulness in Education: Integrating Theory and Research into Practice (Eds KA Schonert-Reichl, RW Roeser):83-97. New York, Springer.

Siegel DJ, Siegel MW, Parker SC (2016) Internal education and the roots of resilience: relationships and reflection as the new R's of education. In Handbook of Mindfulness in Education: Integrating Theory and Research into Practice (Eds KA Schonert-Reichl, RW Roeser):47-65. New York, Springer.

Slagter HA, Lutz A, Greischar LL, Francis AD, Nieuwenhuis S, Davis JM et al.(2007) Mental training affects distribution of limited brain resources. Plos Biol, 5:1228-1235.

Smalley SL, Loo SK, Hale TS, Shrestha A, McGough J, Flook L et al. (2009) Mindfulness and attention deficit hyperactivity disorder. J Clin Psychol, 65:1087-1098.

Suárez-García Z, Álvarez-García D, García-Redondo P, Rodríguez C (2020) The effect of a mindfulness-based intervention on attention, self-control, and aggressiveness in primary school pupils. Int J Environ Res Public Health, 17:2447.

Sumantry D, Stewart KE (2021) Meditation, mindfulness, and attention: a meta-analysis. Mindfulness, 12:1332–1349.

Tang YY, Ma Y, Wang J, Fan Y, Feng S, Lu Q, Yu Q et al. (2007) Short-term meditation training improves attention and self-regulation. Proc Natl Acad Sci U S a, 104:17152-6.

Tang YY, Posner MI (2015) Mindfulness in the context of the attention system. In Handbook of Mindfulness in Education: Integrating Theory and Research into Practice (Eds KA Schonert-Reichl, RW Roeser):481-90. New York, Springer.

Tarrasch R (2018) The effects of mindfulness practice on attentional functions among primary school children. J Child Fam Stud, 27:2632–2642.

Thomas G, Atkinson C (2016) Measuring the effectiveness of a mindfulness-based intervention for children's attentional functioning. Educational and Child Psychology, 33:51–64.

Treisman A (2006) How the deployment of attention determine what we see. Vis Cogn, 14:411-443.

Valentine ER, Sweet PLG (1999) Meditation and attention: a comparison of the effects of concentrative and mindfulness meditation on sustained attention. Ment Health Relig Cult 2:59–70.

Verhaeghen P. (2021) Mindfulness as attention training: meta-analyses on the links between attention performance and mindfulness ınterventions, long-term meditation practice, and trait mindfulness. Mindfulness, 12:564–581.

Vuilleumier P (2005) How brains beware: neural mechanisms of emotional attention. Trends Cogn Sci, 9:585-94.

Wadlinger HA, Isaacowitz DM (2011) Fixing our focus: Training attention to regulate emotion. Pers Soc Psychol Rev, 15:75–102.

Wenk-Sormaz H (2005) Meditation can reduce habitual responding. Altern Ther Health M, 11:32–58.

Williams JA (2010) What is mindfulness? Buddhist and contemporary scientific perspectives. (Master's thesis). San Francisco, Saybrook University.

Wisner BL (2014) An exploratory study of mindfulness meditation for alternative school students: perceived benefits for improving school climate and student functioning. Mindfulness, 5:626–638.

Zeidan F, Johnson SK, Diamond BJ, David Z, Goolkasian P. (2010) Mindfulness meditation improves cognition: evidence of brief mental training. Conscious Cogn, 19:597-605.

Zhang A, Zhang Q (2023) How could mindfulness-based intervention reduce aggression in adolescent? Mindfulness, emotion dysregulation and self-control as mediators. Curr Psychol, 42:4483–4497.

Zhang D, Lee EKP, Mak ECW, Ho CY, Wong SYS (2021) Mindfulness-based interventions: an overall review. Br Med Bull, 138:41-57.

Zikopoulos B, Barbas H (2012) Pathways for emotions and attention converge on the thalamic reticular nucleus in primates. J Neurosci, 32:5338-50.

Zylowska L, Ackerman DL, Yang MH, Futrell JL, Horton NL, Hale TS, Pataki C, Smalley SL (2008) Mindfulness meditation training in adults and adolescents with ADHD: a feasibility study. J Atten Disord, 11:737-746.

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