

The Effect of a Brief Mindfulness Instruction  
and Perfectionism on Attentional Performance

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### Abstract

Because of the possible drawbacks to extensive mindfulness training and the importance of attention for human functioning and well-being, the current study investigated the effects of a 60-minute mindfulness instruction on attentional performance. It was hypothesized that as compared to the control instruction, the brief mindfulness instruction would improve attention. Additionally, it was examined whether the level of perfectionism predicted the improvements in attentional performance after the brief mindfulness instruction. It was hypothesized that a higher level of perfectionism predicted less improvement in attentional performance after the mindfulness instruction. Healthy adults completed a test of attentional performance before and after a brief mindfulness ( $n = 42$ ) or a control instruction ( $n = 40$ ). Also, a self-report measure of perfectionism was completed before the instruction. Results demonstrated that the brief mindfulness and control instruction both resulted in improved attentional performance. Therefore, the mindfulness instruction was not likely to have caused these improvements. Furthermore, perfectionism was not found to predict the amount of improvement after the mindfulness instruction. These findings in conjunction with previous research suggest that distributed mindfulness practice is necessary to improve attention. Further research must indicate what the minimal duration of brief mindfulness training should be, how the sessions should be distributed over time and what the association is between perfectionism and the effects of brief mindfulness training attentional performance.

### Samenvatting

Vanwege de mogelijke nadelen die kleven aan reguliere mindfulness training en het belang van aandacht voor het menselijk functioneren en welzijn, onderzocht de huidige studie het effect van een mindfulness instructie van 60 minuten op aandacht. De hypothese was dat een korte mindfulness instructie aandacht zou verbeteren in vergelijking met de controle instructie. Ook onderzocht deze studie of perfectionisme de verbetering in aandacht zou voorspellen na de mindfulness instructie. Er werd verondersteld dat meer perfectionisme minder verbetering in aandacht voorspelde na de korte mindfulness instructie. Gezonde volwassenen deden voor en na de korte mindfulness ( $n = 42$ ) of controle instructie ( $n = 40$ ) een test die aandacht mat. Ook vulden ze voor de instructie een zelf-rapportage vragenlijst over perfectionisme in. De resultaten lieten zien dat zowel de korte mindfulness instructie, als de controle instructie zorgden voor verbeteringen in aandacht. Hierdoor is het niet waarschijnlijk dat de korte mindfulness instructie deze verbeteringen heeft veroorzaakt. Bovendien voorspelde perfectionisme de hoeveelheid verbetering in aandacht na de korte mindfulness instructie niet. Deze bevindingen samen met eerder onderzoek suggereren dat mindfulness training verdeeld over verschillende sessies noodzakelijk is om aandacht te verbeteren. Verder onderzoek zal moeten uitwijzen hoeveel sessies er nodig zijn, hoe ze het beste verdeeld kunnen worden en wat de associatie is tussen perfectionisme en het effect van een korte mindfulness training op aandacht.

### **Preface**

The idea of the current study started with an interest in stress, perfectionism, mindfulness and the short-term effects of mindfulness. By brainstorming together with my fellow students and supervisor the ideas and interests became a concrete research proposal. At that moment, I would never have thought that this research would be so educational and fun.

Doing this research taught me how to practice mindfulness. I had heard about mindfulness, but I never have tried practicing it. I am pleased that I got the opportunity to practice with it during the trainings. I also enjoyed providing trainings and interacting with participants. However, at times I was frustrated, because participants did not show up, I had a writer's block or I could not find any suitable previous research. These challenges taught me the most, namely how to persevere.

Without the help of my supervisor and fellow students, I would not have been able to do this research and write my thesis. Therefore, I would like to thank my supervisor, Dr. Sabine van Linden, for her guidance, advice and direction during this process. In addition, I would like to thank my fellow students: Astrid Janssen, Renske Geerling and Sylvia Nijhoff for doing this research with me.

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The Effect of a Brief Mindfulness Instruction and Perfectionism  
on Attentional Performance

Deficits in attention (neglect, perseveration and distractibility) significantly decrease or limit the functional ability of individuals in many areas (Žagavec, Lešnik, & Goljar, 2015). Previous research for example, showed that attentional deficits are a core feature of schizophrenia, which is a severe psychological illness (Lawrence, Rossy, Hoffmann, Garavan, & Steiny, 2003). Conscious control of attentional processes could help prevent psychological distress and has beneficial effects on psychological well-being (Rueda, Posner, & Rothbart, 2004).

By training, conscious control of attentional processes can be improved (Bherer et al., 2005; Bherer et al., 2006; Green & Bavelier, 2003; Posner, Sheese, Odludas, & Tang, 2006; Rueda et al., 2004). Various studies have found an association between mindfulness training and improvements in attentional regulation and functioning (Chambers, Lo, & Allen, 2008; Chiesa, Calati, & Serretti, 2011; Jha, Krompinger, & Baime, 2007; Lazar et al., 2005; Moore & Malinowski, 2009; Napoli, Krech, & Holley, 2005; Rani & Rao, 1996; Schmertz, Anderson, & Robins, 2009, Semple, 2010; Slagter et al., 2007; Valentine & Sweet, 1999). Furthermore, practising mindfulness seems to be related to increased activity in brain regions associated with the self-regulation of attention (Brefczynski-lewis, Lutz, Schaefer, Levinson, & Davidson, 2007; Dunn, Hartigan, & Mikulas, 1999; Lazar et al., 2005; Moore, Gruber, Derose, & Malinowski, 2012; Tang & Posner, 2009). In addition to improvements in attentional regulation, mindfulness training in varying formats has been found to contribute to overall enhancement of physical and psychological well-being (Astin, 1997; Carmody & Baer, 2008; Charoensukmongkol, 2014; Chiesa & Serretti, 2009; Williams, Kolar, Reger, & Pearson, 2001; Zeidan, Johnson, Diamond, David, & Goolkasian, 2010). Moreover, this type of training could be practised anywhere (Dunn et al., 1999; Kostanski & Hassed, 2008), does

not require any special equipment or large financial expenses (Kostanski & Hassed, 2008) and is applicable to a wide variety of problems and populations (both clinical and nonclinical; Baer, Fischer, & Huss, 2005; Chiesa & Serretti, 2009; Klatt, Buckworth, & Malarkey, 2009; Kuyken et al., 2008; Roemer, Orsillo, & Salters-Pedneault, 2008). A problem however, is that mindfulness practice which is often conceptualised in terms of cognitive training, typically involves an 8-week programme, comprising of group sessions of 2 hours per week and individual daily home practice of 40 minutes per day (Huppert & Johnson, 2010). Consequently, in today's busy society most individuals do not have the time or resources to participate in such an extensive training (Zeidan et al., 2010). Also, for many individuals who work and live under high levels of stress, the intensity of extensive mindfulness training is aversive (Mackenzie, Poulin, & Seidman-Carlson, 2006). Additionally, mindfulness practice takes a lot of cognitive effort to initially enact. When there are no short-term benefits, individuals could get discouraged to practise mindfulness for a long period of time because of the cognitive effort it requires. This may cause dropout of trainees (Wadlinger & Isaacowitz, 2010).

A brief mindfulness instruction, when shown to be effective in improving conscious control of attentional processes, may be a good alternative to extensive training. It would make mindfulness practice more attractive and more easily to disseminate (Carmody & Baer, 2009; Zeidan et al., 2010). Also, when there are immediate benefits to practising mindfulness, individuals may feel more inclined to continue practice, which can lead to better health outcomes (Grossman, Niemann, Schmidt, & Walach, 2004). Therefore the current study examined whether a brief mindfulness instruction, compared to a control instruction, could improve control of attentional processes and thereby attentional performance.

A few previous studies have examined the effectiveness of brief mindfulness interventions in improving attentional control and performance. For example, Tang and

colleagues (2007) showed that compared to a control group, five days of 20-minute integrative body-mind training (IBMT) improved performance of undergraduate Chinese students on attentional tasks. Nevertheless, it remains unclear whether mindfulness was the mechanism underlying improvements, because IBMT incorporates various techniques (e.g. mindfulness, guided-imagery; Tang et al., 2007). Another study reported improved performance of healthy students on attentional tasks after four days of 20-minute mindfulness practice, compared to a control group (Zeidan et al., 2010). Additionally, a study by Wenk-Sormaz (2005) demonstrated that three sessions of 20-minute mindfulness practice resulted in improved attentional control by decreasing automatic responding on an attentional task in a healthy population. Although interventions in the above-described studies were short, the current study is the first to provide data on whether a mindfulness training as short as one session of 60 minutes can ensure attentional improvements.

Improvements in conscious control of attentional processes could also help prevent problems related to maladaptive perfectionism (Burns, Lee, & Brown, 2011; Delgado et al., 2010; Jain et al., 2007; Masuda & Tully, 2012; Nyklíček, Mommersteeg, Van Beugen, Ramakers, & Van Boxtel, 2013). Maladaptive perfectionists are individuals with elevated perfectionistic standards. They strive compulsively to meet impossibly high standards and have an inability to accept being and behaving less than perfect, which can cause extreme distress (Lundh, 2004; Slade & Owens, 1998). This is accompanied by cognitive rumination over mistakes and imperfections (Frost & Henderson, 1991; Slade & Owens, 1998), whereby attention is automatically focussed on failure (Hewitt & Flett, 1991; Hollender, 1965). Focussing attention on failure limits the attentional resources as a result of being cognitively preoccupied with ruminating about one's failures, narrowing the available cognitive resources (Desnoyers & Arpin-Cribbie, 2015). This results in an increased amount of time it takes to perform a task (Stoeber, Chesterman, & Tarn, 2010) and diminished productivity (Sherry,



Hewitt, Sherry, Flett, & Graham, 2010). Focussing attention on failure also elicits negative affective states that may trigger psychological problems (Bieling, Israeli, & Antony, 2004; Stoeber & Rennert, 2008). A psychological problem highly related to perfectionism is burnout (a psychological phenomenon characterized by physical, emotional and mental exhaustion that results from experiencing excessive stress over a prolonged period of time; Maslach, Schaufeli, & Leiter, 2001; Schaufeli & Greenglass, 2001; Smith, 1986; Stoeber & Rennert, 2008; Zhang, Gan, & Cham, 2007). In 2015 nearly 14 percent of the Dutch employees reported suffering from burnout related problems several times a month or more (Hooftman et al., 2016), and it resulted in substantial costs for employers and government (Levi, 2005). It is therefore important to prevent maladaptive perfectionism from resulting in burnout related problems.

A practice that may help prevent this by improving conscious control of attentional processes (Burns et al., 2011; Delgado et al., 2010; Jain et al., 2007; Masuda & Tully, 2012; Nyklíček et al., 2013) is mindfulness. However, little research has been done on mindfulness and perfectionism. A study by Short and Mazmanian (2013) whereby students of a Canadian university had to complete questionnaires about their level of rumination, perfectionism, mindfulness, depression and anxiety, demonstrated an association between high levels of mindfulness and significant lower levels of perfectionism, negative repetitive thoughts and distress. It has been argued that mindfulness may prevent distress in perfectionists because mindfulness provides skills to interrupt repetitive unhelpful thinking patterns, such as rumination (Short & Mazmanian, 2013). Another study by Azam et al. (2015) investigated whether after cognitive stress induction, 10-minute mindfulness training would promote relaxation in maladaptive perfectionists. This study demonstrated that maladaptive perfectionists, compared to controls, showed no significant response of relaxation after 10 minutes of mindfulness training (Azam et al., 2015). These findings were explained using the

'perseverative cognition' model. This model describes that a stress response is activated and elongated by worrying and ruminating after a stressful event (Brosshot, 2010). A cognitive stress induction in the study by Azam et al. (2015) included a self-evaluative component by providing immediate feedback to the participants about their performance on a pattern recognition task. Given perfectionists' higher tendency for self-evaluative cognitions, the stress induction could have caused them to worry and ruminate about their performance on the pattern recognition task. This may have led to a perseverative stress response during mindfulness practice, and thereby no significant response of relaxation after the 10 minutes of mindfulness (Azam et al., 2015). Considering these results, Azam et al. (2015), similarly to Short and Mazmanian (2013), promote further research into mindfulness practice and perfectionism. Since no previous research examined whether the level of perfectionism predicts the amount of attentional improvement after a 60-minute mindfulness instruction, the current study aimed to do this.

Mindfulness practice originated as a form of Buddhist meditation. Today in Western society, it is usually administered in the form of mindfulness-based stress reduction (MBSR; Kabat-Zinn, Lipworth, & Burney, 1985) or mindfulness-based cognitive therapy (MBCT; Segal, Williams, & Teasdale, 2002). Throughout the mindfulness interventions, individuals learn to focus attention on a stimulus such as their breathing (Brefczynski-lewis et al., 2007), and enhance perceived detail of that stimulus aimed at developing the ability to regulate and control attention (Wallace, 1999). Attention is the foundation of most cognitive and neuropsychological functions, including memory, spatial organization and language (Cooley & Morris, 1990; Žagavec et al., 2015). It can be defined as a cognitive mechanism that facilitates the selection and conscious processing of important or interesting information (Martens & Wyble, 2010; Toates, 2006). Because of the limited capacity of the human brain to process simultaneous information (Fenske & Eastwood, 2003; Martens & Wyble, 2010),

visual attention enables attention for information that is relevant for a person's goals and reduced attention for information that is irrelevant (Fenske & Eastwood, 2003; Kastner, Pinsk, De Weerd, Desimone, & Ungerleider, 1999). Only a small part of the information will reach the brain via the human senses (Martens & Wyble, 2010). In this way, a person's image of the world and oneself is determined by the information that is attended to (Wallace, 2006; Wells, 2007).

To keep attending to the stimulus (e.g. the breathing) during the mindfulness instruction, the individual has to constantly monitor the quality of attention. Whenever attention wanders away from the stimulus, the individual is instructed to simply take notice of what the mind wandered to and accept this without making judgements about it or elaborating on its implications, meanings, or need for action (Kabat-Zinn, 1990; Segal et al., 2002). Then the individual is instructed to disengage attention from what the mind had wandered to and return it to the stimulus (Lutz, Slagter, Dunne, & Davidson, 2008; Wadlinger & Isaacowitz, 2010). As such, mindfulness practice is characterized by two principal components: the self-regulation of attention so that it is directed to immediate experience and an open and accepting awareness of experiences in the present moment (Bishop et al., 2004).

Ultimately, the aim is for the individual to use the technique learned during the mindfulness training outside of the formal training. Whenever a general lack of awareness is noticed or that attention has become focused on streams of thoughts, worries, or ruminations, the individual has to bring awareness back to the here-and-now using the breathing as an anchor (Bishop et al., 2004). Practising these techniques results in improvements in meta-cognition (Carmody & Baer, 2009; Rapgay, Bystritsky, Dafter, & Spearman, 2011) and in a state of mindfulness (Bishop et al., 2004). Meta-cognition is the conscious awareness and understanding of one's thinking and cognitive processes (Fernandez-Duque, Baird, & Posner, 2000). Improvements in meta-cognition are related to an enhanced ability to monitor and

control attentional processes (Posner & Rothbart, 1998). This allows attention to become less automatically fixated on certain (negative) information, thoughts or feelings. Consequently, attentional resources are available for a greater variety of experiences and information, that would otherwise be ignored (Carmody & Baer, 2009). These experiences result in the correction of distorted and maladaptive cognitions and perceptions, which in turn results in positive benefits for psychological well-being (Blackburn & Davidson, 1995; Mischel & Ayduk, 2002; Rueda et al., 2004; Ruff & Rothbart, 1996). The state of mindfulness has been described as non-elaborative and non-judgmental present-centered awareness in which thoughts, feelings and sensations that arise are acknowledged and accepted as they are (Kabat-Zinn, 1994; Segal et al., 2002). Thoughts, feelings and sensations are observed simply as events in the mind, which prevents over-identifying with them or reacting to them in an automatic pattern of reactivity. In this way, mindfulness enables the individual to respond more reflectively to situations (Bishop et al., 2004).

In the current study, one group of participants received a brief mindfulness instruction of 60 minutes and another group received a 60-minute control instruction. Both groups completed a test of attentional performance before and after the instruction. Also, both groups completed an inventory which determined the frequency of participants' perfectionistic cognitions. It was investigated whether, compared to a control instruction, a 60-minute mindfulness instruction would result in improved attentional performance. During the mindfulness instruction participants practised with focusing attention on a target object. Thereby, they practised with monitoring the quality of attention, and bringing attention back to the target object, when attention wandered. Since previous research suggested that attentional control improves with practise (Halperin, Sharma, Greenblatt, & Schwartz, 1991; MacLeod, 1991), and based on previous research that demonstrated a positive effect of a brief mindfulness training on attentional functioning and control (Tang et al., 2007; Wenk-Sormaz,

2005; Zeidan et al., 2010), it was expected that as compared to a control instruction, a 60-minute mindfulness instruction would improve attentional performance.

A further aim of the present study was to examine whether an individual's level of perfectionism predicts the amount of attentional improvement after a 60-minute mindfulness instruction. Previous research demonstrated that perfectionists report higher levels of rumination than other individuals (O'Connor, O'Connor, & Marshall, 2007). Rumination narrows the available cognitive resources, due to being cognitively preoccupied (Desnoyers & Arpin-Cribbie, 2015), leading to impaired concentration and task performance (Lyubomirsky, Kasri, & Zehm, 2013; Philippot & Brutoux, 2008). Although extensive mindfulness practice is found to be effective in decreasing rumination (Chambers et al., 2008), it is expected that higher levels of perfectionism predict less improvement in attentional performance after the brief mindfulness instruction. This is expected because of the higher levels of rumination of individuals high in perfectionism, compared to individuals low in perfectionism (O'Connor et al., 2007).

There is much to gain from a study on these subjects. Firstly, an understanding of the relationship between attentional performance, perfectionism and a brief mindfulness instruction could advance current knowledge about attentional performance improvements related to training and perfectionism (Jha et al., 2007). In addition, it is important to establish the amount of training that is necessary to produce its attentional benefits before a brief mindfulness training can be widely applied and possibly used to prevent psychological problems related to maladaptive perfectionism. Furthermore, when improvements in attentional performance are associated with a brief mindfulness instruction, further research could be conducted to examine whether or not these changes correspond to observable clinical benefits, especially for maladaptive perfectionists. If so, clinicians could possibly implement a brief mindfulness instruction into treatments (Jha et al., 2007).

## Methods

### Participants

The sample of this study consisted of 89 Dutch-speaking participants without motor or cognitive disabilities. Based on earlier research into the effects of short mindfulness training on attentional functioning a power of .55 to detect an effect size of approximately .25 (medium) with Cronbach's  $\alpha = .05$  was expected (Tang et al., 2007; Wenk-Sormaz, 2005; Zeidan et al., 2010). Given this power and effect size, a sample of at least 72 participants was required. Participants were recruited by social media (Facebook), distributing flyers at Utrecht University and the social network of the researchers. Psychology students of Utrecht University received course credit for participating in this research. The remainder of the participants enrolled on a voluntary basis.

Variables gender, age, education level and the hours the participants had slept the night before this study were used as control variables in the current research. This is because previous research illustrated that males, younger participants and individuals with a higher number of years spent in education performed better on the d2 Test of Attention (Bates & Lemay, 2004; Brickenkamp & Zillmer, 1998). Research also showed that sleep deprivation impairs attention, especially alertness (Alhola & Polo-Kantola, 2007; Doran, Van Dongen, & Dinges, 2001; Jennings, Monk, & van der Molen, 2003). Therefore it was examined whether the mindfulness and control condition were comparable in gender distribution, age, education level and hours of sleep, so that a possible found improvement in attentional performance could not be explained by a difference in control variables between the two conditions.

### Materials

**Perfectionism Cognitions Inventory.** Perfectionism was assessed using the Perfectionism Cognitions Inventory (PCI), developed by Flett, Hewitt, Blankstein, and Gray

(1998). Specifically, this inventory consists of 25 items and determines the frequency of participant's automatic thoughts with perfectionist themes that highlight the discrepancy between the current and ideal self (Flett et al., 1998). Participants indicated on a 5-point Likert scale (varying from 0 = not at all to 4 = all of the time) how often they experienced perfectionistic thoughts (e.g. 'I must be efficient at all times') in the previous week. Research indicated that the PCI is a valid and reliable instrument with high internal consistency (Cronbach's  $\alpha = .96$ ; Azam et al., 2015).

**Brief mindfulness instruction.** The brief mindfulness instruction that was used in the current study took approximately 60 minutes and was given in small groups of two to eight participants. The instruction started with a presentation about attention of approximately 30 minutes. This was done on the basis of a PowerPoint presentation (see Appendix). The goal of this presentation was to explain the different types of attention, the functions of attention, the possible consequences of deficits in attention and thereby explaining the importance of attention for humans and human performance. In this way, participants could obtain insight in the way attentional training works and its benefits. After this presentation about attention, two exercises were performed. The first exercise was a body scan based on De Haas (2007). During this exercise, which was carried out for roughly fifteen minutes, participants were instructed to relax first, with their eyes closed. Then participants were taught to selectively direct their attention to different parts of their body. Also, participants practiced shifting attention away from one part of the body (e.g. the forehead), to another part of the body (e.g. the eyes). When participants got distracted by their thoughts, they calmly brought their attention back to the body part they had to direct their attention to at that moment (De Haas, 2007). After this exercise was done, there was room for questions and interaction. Thereafter, a breathing exercise, based on Wallace (2006), was carried out for approximately ten minutes.

Participants again were instructed to relax, with their eyes closed, and to focus on the flow of their breath. If a random thought arose, participants had to passively notice and acknowledge the thought and to simply let it go, by bringing the attention back to the sensations of the breath. Participants were also taught to notice sensations that arose in the body, and to simply acknowledge those sensations and then to return their attention back to their breath (Wallace, 2006). Again after this exercise was done, participants had the possibility to ask questions and interact with each other. The goal of both the body scan and the breathing exercise was to develop non-task-specific skill in regulating and controlling attention (Wallace, 1999).

**Control instruction.** The control instruction started with a documentary, ‘The Buddhist Science of the Mind’ (Davis, 2013), which lasted for 38 minutes and 33 seconds. A beamer was used to show the documentary to small groups of two to eight participants. One of the student trainers sat with the participants to monitor attentiveness during the documentary. Afterwards, a brief visualisation exercise based on Reinders (2008) was carried out for approximately ten minutes. Participants were instructed to relax, with their eyes closed, and to visualise walking through a forest and hearing sounds of animals and rustling of trees and bushes (Reinders, 2008). The goal of this exercise is to make the control instruction resemble the brief mindfulness instruction, but without training attention. Finally, there was room for questions and interaction. The control instruction took around 60 minutes.

**d2 Test of Attention.** Changes in attentional performance within participants after the brief mindfulness or control instruction were measured using the d2 Test of Attention. As shown in Table 1, four outcome measures were used as indicators for attentional performance on this test. The d2 Test is a timed paper-and pencil cancellation task that allows for an estimation of attentional performance as it measures processing speed, rule compliance and



quality of performance (Brickenkamp & Zillmer, 1998). It consists of 658 items, divided into 14 rows each consisting of 47 items. These items are composed of the letters 'p' or 'd' with one to four dashes above and/or below the letters. The task is to discriminate and cancel through targets from visually similar non-targets. The target is the letter 'd' with two dashes above, two dashes below or one dash above and the other dash below the letter 'd'.

Participants were instructed by the trainer to work as fast as possible without committing errors. Every 20 seconds the trainer told the participants to stop working on the current row and continue with the next row. Bates and Lemay (2004) describe the d2 Test as a valid instrument with high internal consistency (Cronbach's  $\alpha = .97$ ).

Table 1

*Abbreviations, Descriptions, and Computation of d2 Test Measures*

Abbreviations	Description of measures	Computation
<i>E</i>	Total errors	Sum of all errors of omission (sum of number of target symbols not cancelled) and commission (sum of number of non-target symbols cancelled)
<i>E%</i>	Percent of errors	Total number of errors divided by the total number of characters processed
<i>TN-E</i>	Total characters correctly processed	Sum of number of characters processed before the final cancellation on each trial minus total errors
<i>CP</i>	Concentration performance	Total number of correctly cancelled characters minus total number incorrectly cancelled

*Note.* Abbreviations designated in the d2 Manual (Brickenkamp & Zillmer, 1998).

## **Procedure**

Participants were recruited to take part in a study about attention. Valentine and Sweet (1999) reported that research about mindfulness often suffers from expectancy effects. In order to prevent expectancy effects from affecting the current study, the word ‘mindfulness’ was deliberately never mentioned during the recruitment of participants. After participants had signed up for this study, they received an email with the informed consent form, information about the time and location of the study and a hyperlink to the self-report measures. Computerized data collection software (Qualtrix) was used, which allowed participants to complete the self-report measures at home. Because participants in the current study took part in a larger study, they completed three more self-report measures besides the PCI (Flett et al., 1998), namely the Self-Assessment Inventory (Zelf-Beoordelings Vragenlijst; ZBV; Van der Ploeg, 2000), the Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996) and the NEO Personality Inventory-3 (NEO PI-3; Costa & McCrae, 2010). Completing these self-report measures took around 30 minutes.

After participants had given informed consent, the first 45 participants that signed up for this study were assigned to the mindfulness condition. Throughout this study another 44 participants signed up, there were assigned to the control condition. Participants in both conditions first were given the paper and pencil version of the d2 Test of Attention. Explanation of the d2 Test and completing the test lasted approximately 10 minutes. Then participants in the mindfulness condition received a brief mindfulness instruction, and participants in the control condition received a control instruction. Trainers that provided the instructions were trained master students Clinical and Health Psychology of the Utrecht University. After instructions were given, both groups completed the d2 Test of Attention a second time. Finally, participants were debriefed.

### Results

Of the 89 participants, four were omitted from the analyses, because they did not fully complete the Perfectionism Cognitions Inventory. Two of these participants were in the mindfulness condition and two were in the control condition. Furthermore, three participants completed the self-report measures without participating in the instruction part of this study. This involved one participant in the mindfulness condition and two participants in the control condition. These participants were also excluded from the analyses.

The remaining 82 participants were included in the analyses, of which 42 in the mindfulness condition and 40 in the control condition. Participants were both female (66%) and male (34%) and were between 19 and 61 years old, with a mean age of 27.15 ( $SD = 10.97$ ). Table 2 shows the descriptive statistics of the participants by condition.

Table 2

*Gender Distribution, Mean Age, Education Level and Hours of Sleep (Standard Deviations in Parentheses) of the Participants by Condition*

	Mindfulness condition			Control condition		
	Men	Women	Total	Men	Women	Total
Gender	$n = 12$	$n = 30$	$n = 42$	$n = 16$	$n = 24$	$n = 40$
Age	26.67 (6.42)	25.37 (8.14)	25.74 (7.64)	31.25 (14.36)	26.88 (13.01)	28.63 (13.57)
Education level	1.50 (0.80)	1.76 (1.19)	1.68 (1.08)	1.88 (1.46)	1.92 (1.66)	1.90 (1.57)
Hours of sleep	6.23 (2.22)	7.22 (1.36)	6.94 (1.68)	7.06 (1.21)	7.19 (1.23)	7.14 (1.21)

*Note.* A mean education level of between 1 - 2 = university/college. Hours of sleep = the amount of sleep the night before participating in the current study.

With a sample size of 82, this design had a power of .60 to detect an effect size of approximately .25 (medium) with Cronbach's  $\alpha = .05$ .

To examine whether there were group (mindfulness versus control) differences in gender distribution a Chi-square test was performed. Results showed that the mindfulness and control condition did not significantly differ in gender distribution,  $\chi^2(1, N = 82) = 1.19, p = .28$ , Cramer's  $V = .12$ . It was also examined whether participants in the mindfulness and control condition differed significantly in level of education. Because multiple cells had an expected count of 5 or less, Fisher's exact test (two-tailed) was used. This test demonstrated a significant difference between the mindfulness and control condition in level of education ( $p = .01$ , Cramer's  $V = .39$ ). As can be seen in Table 2, on average participants in the control condition were higher educated than participants in the mindfulness condition. In addition, independent-samples  $t$ -tests were conducted to find out whether participants in the mindfulness and control condition were comparable in age and the hours of sleep the night before this study. Results revealed that participants in both conditions were comparable in age,  $t(61) = -1.18, p = .24$  and the hours of sleep the night before this study,  $t(80) = .62, p = .54$ .

### **Hypothesis 1: A Brief Mindfulness Instruction of 60 Minutes Results in Improved Attentional Performance, Compared to a Control Instruction**

Mean d2 Test scores ( $E$ ,  $E\%$ ,  $TN-E$  and  $CP$ ) of the participants at pre- and post-test and associated standard deviations by condition are displayed in Table 3. An analysis of variance (ANOVA) on mean  $E$ ,  $E\%$ ,  $TN-E$  and  $CP$  scores was performed, with time (pre-test versus post-test) as within-subjects variable and condition (mindfulness versus control) as between-subjects variable. Analysis revealed a significant main effect of time on mean  $E$  scores,  $F(1, 80) = 128.14, p < .001, \eta^2 = .62$ . At post-test the mean total number of errors ( $E$ )

on the d2 Test was significantly decreased ( $M = 72.85$ ,  $SD = 51.09$ ), compared to the mean total number of errors at pre-test ( $M = 103.10$ ,  $SD = 55.47$ ). Furthermore, analysis demonstrated a significant main effect of time on mean  $E\%$  scores,  $F(1, 80) = 116.37$ ,  $p < .001$ ,  $\eta^2 = .59$ . As compared to the pre-test ( $M = 23.79$ ,  $SD = 15.84$ ), the mean error percentage ( $E\%$ ) at post-test was significantly lower ( $M = 14.85$ ,  $SD = 12.20$ ). Subsequently, a significant main effect of time on mean  $TN-E$  scores was found,  $F(1, 80) = 242.28$ ,  $p < .001$ ,  $\eta^2 = .75$ . This shows that at post-test the mean total number of characters correctly processed ( $TN-E$ ) significantly increased ( $M = 463.59$ ,  $SD = 120.15$ ), compared to pre-test ( $M = 367.67$ ,  $SD = 127.56$ ). There was also a significant main effect of time on mean  $CP$  scores,  $F(1, 80) = 237.19$ ,  $p < .001$ ,  $\eta^2 = .75$ . Mean concentration performance ( $CP$ ) was significantly higher at post-test ( $M = 215.51$ ,  $SD = 44.53$ ), compared to this score at pre-test ( $M = 181.26$ ,  $SD = 44.84$ ). In conclusion, all mean d2 Test scores improved at post-test, compared to mean pre-test scores.

No significant main effect of condition was found on mean  $E$  scores,  $F(1, 80) = .15$ ,  $p = .70$ ,  $\eta^2 = .00$ , on mean  $E\%$  scores,  $F(1, 80) = .07$ ,  $p = .80$ ,  $\eta^2 = .00$ , on mean  $TN-E$  scores,  $F(1, 80) = .29$ ,  $p = .59$ ,  $\eta^2 = .00$  and on mean  $CP$  scores,  $F(1, 80) = .61$ ,  $p = .44$ ,  $\eta^2 = .01$ . This implies that there were no significant differences found between mean d2 Test scores of participants in the mindfulness and control condition.

Finally, no significant interaction effect was found between the time the d2 Test was performed (pre-test versus post-test) and the condition the participant was in (mindfulness versus control), on mean  $E$  scores,  $F(1, 80) = .38$ ,  $p = .54$ ,  $\eta^2 = .01$ , on mean  $E\%$  scores,  $F(1, 80) = .08$ ,  $p = .77$ ,  $\eta^2 = .00$ , on the mean  $TN-E$  score,  $F(1, 80) = .10$ ,  $p = .76$ ,  $\eta^2 = .00$  and on mean  $CP$  scores,  $F(1, 80) = .60$ ,  $p = .44$ ,  $\eta^2 = .01$ . This means that there is no significant difference between the mindfulness and control condition in the difference between mean pre-test and mean post-test scores (effect scores; see Table 3).

Table 3

*Mean d2 Test Scores (Standard Deviations in Parentheses) at Pre- and Post-test by Condition*

Score	Mindfulness			Control		
	Pre-test	Post-test	Effect	Pre-test	Post-test	Effect
<i>E</i>	106.07 (50.97)	74.21 (46.33)	-31.86	99.98 (60.33)	71.42 (56.21)	-28.56
<i>E%</i>	24.06 (14.33)	15.34 (12.11)	-8.72	23.51 (17.48)	14.32 (12.42)	-9.19
<i>TN-E</i>	359.74 (112.68)	457.52 (117.03)	97.78	376.00 (142.51)	469.95 (124.52)	93.95
<i>CP</i>	176.74 (36.41)	212.67 (42.16)	35.93	186.00 (52.31)	218.50 (47.25)	32.50

*Note.* Effect = mean post-test score minus mean pre-test score.

It did not matter if participants received a brief mindfulness instruction (mindfulness condition) or a control instruction (control condition), because the d2 Test scores of all participants in both conditions improved after the instruction, compared to before the instruction. In conclusion, hypothesis 1 which states that a brief mindfulness instruction of 60 minutes results in improved attentional performance, compared to a control instruction was not confirmed.

### **Hypothesis 2: Higher levels of perfectionism predict less improvement in attentional performance after the brief mindfulness instruction**

A linear regression analysis was performed using the level of perfectionism of the participants ( $M = 64.69$ , range: 39-99,  $SD = 16.66$ ) as independent variable and the *E* effect score (mean *E* post-test score minus mean *E* pre-test score) of participants in the mindfulness condition as dependent variable. This regression model was not proven to be significant,  $F(1,$

40) = 1.88,  $p = .88$ . Another regression model whereby the level of perfectionism of the participants was again used as independent variable and the  $E\%$  effect score of participants in the mindfulness condition was used as dependent variable, was also not found to be significant,  $F(1, 40) = .59$ ,  $p = .45$ . Subsequently, a third linear regression analysis showed that the level of perfectionism of the participants did not significantly predict the  $TN-E$  effect score of participants in the mindfulness condition,  $F(1, 40) = .18$ ,  $p = .68$ . An additional regression model whereby the level of perfectionism of the participants was again used as independent variable and the  $CP$  effect score of participants in the mindfulness condition was used as dependent variable, was also not found to be significant,  $F(1, 40) = .13$ ,  $p = .72$ . In short, the level of perfectionism of the participants cannot be used to predict changes in attentional performance after the brief mindfulness instruction. Consequently, hypothesis 2 which states it that higher levels of perfectionism predict less improvement in attentional performance after the brief mindfulness instruction was not confirmed.

### Discussion

The principal objective of the present study was to investigate the effect of a 60-minute brief mindfulness instruction on attentional performance. It was hypothesized that, as compared to the control instruction, the brief mindfulness instruction would result in improved attentional performance. An additional goal of this study was to examine whether the level of perfectionism predicts the amount of attentional improvement after a 60-minute mindfulness instruction. Specifically, it was hypothesized that higher levels of perfectionism predict less improvement in attentional performance after the brief mindfulness instruction. The first hypothesis was not supported. That is, both the brief mindfulness instruction and the control instruction resulted in improved attentional performance. Therefore, it cannot be assumed that the brief mindfulness instruction caused improvements in attentional

performance. In addition, the second hypothesis was not supported. Higher levels of perfectionism were not found to predict less improvement in attentional performance after the brief mindfulness instruction. In fact, perfectionism was not found to predict changes in attentional performance after the brief mindfulness instruction at all.

Since previous research demonstrated improvements in attentional control and performance after mindfulness training (Chambers et al., 2008; Chiesa et al., 2011; Jha et al., 2007; Lazar et al., 2005; Moore & Malinowski, 2009; Napoli et al., 2005; Rani & Rao, 1996; Schmertz et al., 2009, Semple, 2010; Slagter et al., 2007; Tang et al., 2007; Valentine & Sweet, 1999; Wenk-Sormaz, 2005; Zeidan et al., 2010), it is remarkable that the current study failed to find a specific effect of the mindfulness instruction on attentional performance. A possible explanation for this is that the present study used a unique short single session mindfulness training. Prior research into the effects of mindfulness training on attention only included training as short as three sessions of 20 minutes (Wenk-Sormaz, 2005). This is the first study to provide data on whether one 60-minute session of mindfulness training can ensure attentional improvements. The present research suggests that one session of 60 minutes of mindfulness may not be sufficient to produce the attentional advantages that were found in previous studies. Earlier research indicated that the duration and quantity of mindfulness practice may be associated with greater attentional improvements (Brown & Engler, 1980; Cahn & Polich, 2006; Lane, Seskevich, & Pieper, 2007; Semple, 2010; Valentine & Sweet, 1999). However, there is no previous research that investigated the minimum amount of mindfulness practice that is necessary for attentional benefits to occur. The current research showed that one session of mindfulness training may not be sufficient to generate the depth of effects necessary for attentional benefits to take place. Earlier research that did find attentional improvements after brief mindfulness training, used training whereby sessions were divided over different moments in time (Tang et al., 2007; Wenk-Sormaz, 2005; Zeidan



et al., 2010). This suggests that distributed mindfulness practice is necessary for attentional improvements to occur (Chan & Woollacott, 2007; Semple, 2010).

Another conceivable explanation for the absence of a specific effect of the brief mindfulness instruction on attentional performance is level of experience of the trainers in the current study. Carmody and Baer (2009) suggested that the level of experience of trainers and the degree to which they embody the principles of mindfulness may influence outcomes of mindfulness training. It is possible that highly skilled trainers are necessary to obtain optimal outcomes with brief mindfulness instructions. Previous research on the effect of brief mindfulness training on attentional functioning, used experienced trainers (several to ten years of experience; Tang et al., 2007; Zeidan et al 2010), in contrast to the trainers in this study. However, there has been no systematic research into the effect of trainer experience on the effects of brief mindfulness training (Carmody & Baer, 2009). According to the Melbourne Academic Mindfulness Interest Group (2006), there are differing views on the necessity of the trainers to be experienced mindfulness practitioners themselves. Traditional mindfulness programmes use trainers that have had extensive mindfulness training. This is because they think that practitioner commitment and example is vital to trainee participation. They suggest that a person is unlikely to properly understand or teach mindfulness without having substantially experienced it themselves (Kabat-Zinn, 1990; Segal et al., 2002). In contrast, alternative schools of thought (e.g. Acceptance and commitment therapists and Dialectical behaviour therapists) believe that mindfulness trainers do not need to be practitioners themselves if they can gain sufficient experience to understand the process during a course (Hayes, Strosahl, & Wilson, 1999; Linehan, 1993). In short, there is currently no consensus as to what the effect is of trainer experience on the effect of brief mindfulness training on attentional performance (Melbourne Academic Mindfulness Interest Group, 2006). Consequently, it is important that future studies systematically investigate this subject.

Although the present study did not demonstrate that the brief mindfulness instruction caused improvements in attentional performance, participants did report feeling more attentive after the mindfulness instruction, compared to after the control instruction. This could possibly be explained by findings of Anderson, Lau, Segal, and Bishop (2007) and Ortner, Kilner, and Zelazo (2007). These studies suggested that mindfulness practice impacts awareness of present moment experience, rather than attentional performance. Thus, participants in the current study may have experienced increased awareness of the present moment after the brief mindfulness instruction, which was interpreted as increased attentiveness. Improvements in awareness of present moment experience cannot be measured by the d2 Test of Attention used in this study (Brickenkamp & Zillmer, 1998) and therefore no specific effects of the brief mindfulness instruction were found on this test. Further research may use a mindfulness questionnaire such as the Freiburg Mindfulness Inventory (FMI; Walach, Buchheld, Buttenmüller, Kleinknecht, & Schmidt, 2006), to measure the impact of a brief mindfulness instruction on awareness of present moment experience.

An inevitable explanation for finding improved attentional performance of both participants in the mindfulness and control condition is the effect of practice. Healthy individuals have the ability to significantly improve performance on tests of attention through practice and being more familiar with test requirements (Feinstein, Brown, & Ron, 1994; Collie, Maruff, Darby, & McStephen, 2003). Since participants had to perform the d2 Test of Attention twice, there is a high probability that test performance was enhanced following repeated exposure to the testing procedure and testing material. According to the d2 Test of Attention manual, practice effects should be minimal (Brickenkamp & Zillmer, 1998). Nevertheless, it is important to take into account, because the effect of practice is a common issue with tests of attention (Feinstein et al., 1994; Collie et al., 2003).

A second possible explanation for finding an improvement in participants' attentional performance both after the brief mindfulness and the control instruction may be test motivation. Participants' motivation to perform well on a test can be influenced by the level of difficulty of that test (Tomporowski & Tinsley, 1996). Tests that are cognitively demanding are intrinsically more motivating for participants to perform, than simple attentional tests (Tomporowski & Tinsley, 1996). The d2 Test of Attention, which was used in the present study to measure attentional performance, is a cognitively demanding test (Brickenkamp & Zillmer, 1998). It may be that this test intrinsically motivated participants both in the mindfulness and control condition to do their utmost to perform well. This motivation could have ensured improvements in attentional performance of participants in both conditions. An indication of the motivation of the participants to perform well on the test, was them reporting during the debriefing that they liked the d2 Test of Attention. They experienced it as a game and were interested in their post-instruction test performance, compared to their pre-instruction test performance.

Furthermore, test motivation could possibly have led to increased attentional effort. Attentional effort can be defined as a motivated activation of attention systems, aimed at stabilizing or recovering attentional performance in response to deteriorating attentional performance (Berridge & Robinson, 2003; Jensen, Vangkilde, Frokjaer, & Hasselbalch, 2012; Sarter, Givens, & Bruno, 2006). People adjust their level of attentional effort in reaction to information about non-compliance with task demands and their motivation to perform well on the task. Increases in attentional effort aim to improve goal-directed behavioural and cognitive processes (Sarter et al., 2006). This gives rise to the possibility that participants in both the mindfulness and control condition increased their attentional effort as a result of the detection of performance errors and their intrinsic motivation to perform well on the cognitive demanding d2 Test. Earlier research indicated that increased attentional effort improved

performance on a choice reaction time task (Pashler, 1998), a sustained attention task (Tomporowski & Tinsley, 1996) and the Stroop colour-word task (Chajut & Algom, 2003). In the present study, increased attentional effort may have improved attentional performance of participants in both the mindfulness and control condition after the instruction.

Another explanation for finding an improvement in participants' attentional performance after both instructions may be that the d2 Test of Attention induced stress (Hancock, 1989). This is because the test is cognitively demanding, which requires extensive application of attentional resources and the test had to be carried out for a relatively long and unbroken period of time. Also, the d2 Test is a timed task, so the time pressure could have caused stress. Chajut and Algom (2003) showed that stress may lead to improved selective attention. Selective attention is the ability to focus attention on relevant information, while filtering out irrelevant information (Parkhurst, Law, & Niebur, 2002). This ability may improve during stress, because stress depletes the available attentional resources. The resources that are left are used for processing the task-relevant attributes (Wells & Matthews, 1994). Stress caused by the d2 Test of Attention and performing the test twice, may have led to the narrowing of attention to the task-relevant attributes, hence improving attentional performance of both participants in the mindfulness and control condition. To test this suggestion future research may use a less cognitively demanding task, without time pressure to measure attentional performance and to rule out effects due to stress.

An additional intention of this study was to investigate whether the level of perfectionism predicts the amount of attentional improvement after a 60-minute mindfulness instruction. Perfectionism was not found to predict changes in attentional performance after mindfulness instruction. A possible explanation for this is that the majority of the participants in the mindfulness condition could be categorized as moderately perfectionistic. Given that in previous studies only those individuals higher in perfectionistic standards tended to

experience cognitive impairments due to rumination (Arpin-Cribbie et al., 2008; Azam et al., 2015; O'Connor et al., 2007; Stöber & Joormann, 2001), it is possible that participants in the current study were able to dedicate an adequate amount of cognitive resources towards the d2 Test of Attention and therefore, perfectionism did not predict attentional performance after the mindfulness instruction.

It is also possible that a moderate level of perfectionism resulted in an average to good attentional performance in this study, because perfectionism is characterised by striving for high standards. When perfectionism is not maladaptive, standards are not likely to be impossibly high. Striving for high feasible standards, is likely to result in good performance (Egan, Wade, & Shafran, 2011).

The present findings have some limitations, however. First of all, the present study did not randomly assign participants to conditions. The first 45 participants who signed up for this study were assigned to the mindfulness condition. Afterwards another 44 participants signed up, who were assigned to the control condition. It is therefore not known whether the influence of confounding variables is the same in both conditions (Altman, 1996). A related limitation is that the level of education of the participants in the current study differed between the mindfulness and the control condition. Earlier research demonstrated that the magnitude of practice effects is greater in participants who are healthy and well educated (Horton, 1992; Rapport, Brines, Axelrod, & Theisen, 1997). Since participants in the control condition were on average higher educated than participants in the mindfulness condition, they may have experienced larger practice effects. This may have caused the improvements in attentional performance of participants in the control condition. Possible additional research could minimize practice effects prior to a mindfulness training by conducting dual baseline assessments of attentional performance and exclude the results of the first assessment from further analysis. This is because practice effects appear to operate mainly between first and

second assessments on most tests of attention (Benedict & Zgaljardic, 1998; Collie et al., 2003).

In spite of the above limitations, this study has yielded important results which are providing input for further research. It was the first study to provide data on whether one 60-minute session of mindfulness training could ensure attentional improvements. The results suggest that one session of mindfulness training may not be sufficient to generate the depth of effects necessary for attentional benefits to take place. Based on these findings and earlier research that demonstrated attentional improvements after brief mindfulness training, whereby sessions were divided over different moments in time (Tang et al., 2007; Wenk-Sormaz, 2005; Zeidan et al., 2010), it is suggested that distributed mindfulness practice is necessary for attentional improvements to occur (Chan & Woollacott, 2007; Semple, 2010). This is in line with findings of Wallace (2006) that suggest that attentional processes can be trained, like muscles can be trained. It takes time to strengthen the muscles through training. It may be that it also takes time to train attentional processes. This implicates that until further research has clarified the minimum length and distribution of mindfulness training that is necessary to produce attentional benefits, the standard 8-week format for mindfulness-based stress reduction (MBSR; Kabat-Zinn et al., 1985) may be the format of choice. This format has acquired the most empirical support for its effectiveness in conjunction with psychological and neuropharmacological therapies (Cahn & Polich, 2006; Carmody & Baer, 2009). However, this 8 week programme may pose a barrier for individuals to start practising mindfulness, because it takes a lot of time and sustained effort (Melbourne Academic Mindfulness Interest Group, 2006). A clinical implication of this is that therapists need to motivate patients to start and continue practising mindfulness. This can be done by explaining the importance of attentional abilities for humans and human performance (James, 1890).

Subsequently, further research could examine the effectiveness of a brief mindfulness instruction in motivating participants to keep practising mindfulness. Participants in the present study mentioned that they liked practising mindfulness during the brief instruction and they experienced it as helping them to be more attentive. Therefore, a brief mindfulness instruction could result in increased motivation to continue practising mindfulness.

Continuing with mindfulness practice can lead to better health outcomes (Grossman et al., 2004). Whether a brief mindfulness instruction results in increased motivation to continue mindfulness practice could be examined by a questionnaire which participants have to fill out before and after the mindfulness instruction. Afterwards, different follow-up measurements could establish the number of participants that indeed continued practising mindfulness and the effects of it on attentional functioning, present moment awareness and psychological well-being.

Although a 60-minute mindfulness instruction seems not to be effective in improving attentional performance, it may be effective in improving awareness of present moment experience. Since participants in the current study reported feeling more attentive after the instruction. Also, Anderson et al. (2007) and Ortner et al. (2007) suggested that mindfulness practice impacts awareness of present moment experience, rather than attentional performance. Improvements in awareness of present moment experience, like improvements in conscious control of attentional processes, benefit psychological well-being and are therefore of great importance (Blackburn & Davidson, 1995; Carmody & Baer, 2009; Mischel & Ayduk, 2002; Rueda et al., 2004; Ruff & Rothbart, 1996). Further research has to find out what the actual effects of a brief mindfulness instruction on awareness of present moment experience are by using a mindfulness questionnaire such as the Freiburg Mindfulness Inventory (Walch et al., 2006).

The present study was also the first to examine whether the level of perfectionism predicts the amount of attentional improvement after a 60-minute mindfulness instruction. This was investigated because improvements in conscious control of attentional processes could help prevent problems related to high perfectionistic standards (Burns et al., 2011; Delgado et al., 2010; Jain et al., 2007; Masuda & Tully, 2012; Nyklíček et al., 2013). When perfectionism is related to improvements in attentional performance after a 60-minute mindfulness instruction, this provides more clarity regarding the relationship between perfectionism and attentional functioning. This may be used for further research into ways to prevent high perfectionistic standards from resulting into problems, such as burnout.

However, in the current study, perfectionism was not found to predict changes in attentional performance after a brief mindfulness instruction. This is likely to be caused by the majority of the participants in the present study being moderately perfectionistic. In previous studies only those individuals higher in perfectionistic standards tended to experience cognitive impairments due to rumination (Arpin-Cribbie et al., 2008; Azam et al., 2015; O'Connor et al., 2007; Stöber & Joormann, 2001). It is possible that a moderate level of perfectionism resulted in an average to good attentional performance in this study, since perfectionism is characterised by striving for high standards and this usually results in good performance, when standards are not impossibly high (Egan et al., 2011). Follow-up research should further examine the relationship between perfectionism and the effectiveness of mindfulness training in preventing problems related to maladaptive perfectionism, such as burnout.

In conclusion, the expectations that as compared to the control instruction, the brief mindfulness instruction would result in improved attentional performance and that higher levels of perfectionism predict less improvement in attentional performance after the brief mindfulness instruction were not confirmed by the present study. However, this study has



made it clear that there is much to gain from further research to determine what the minimal duration of brief mindfulness training should be, how the sessions should be distributed over time and what the association is between perfectionism and the effects of a brief mindfulness training in order to attain the most beneficial results in improving attentional functioning. It is recommend that future studies also focus on evaluating the effects of brief mindfulness training on awareness of present moment experience and motivation to continue practising mindfulness.

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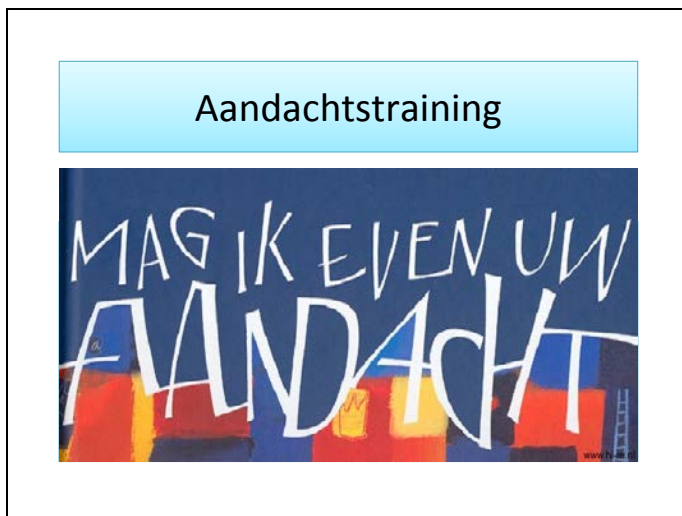
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## Appendix

**PowerPoint Handout: Presentation About Attention.** Shown in Figure 1 are the PowerPoint slides used for the presentation about attention, during the brief mindfulness instruction. The slides are in Dutch and the English translation of the text on the slides can be found next to the slides.

Slide 1



### Attention training

Your attention please.

Slide 2



### Program

- Test of attention
- Presentation about attention
- Exercises
- Test of attention
- Conclusion



Slide 3

**Aandachtstaak** (Brickenkamp & Zillmer, 1998)



Dan is het nu tijd voor 10 minuten oprechte aandacht....  
De Spreekwijze Floccof

**Test of attention**

It is now time for ten minutes of genuine attention....

Slide 4

**Aandacht**

- Het vermogen om de benodigde energiebronnen aan te spreken en te richten op een stimulus voor informatieverwerking.
- Om tot een coherent en begrijpelijk beeld van de wereld om ons heen te komen.

**Attention**

- The ability to consult the needed resources and focus these on a stimulus in order to process information.
- In order to establish a coherent and clear world view.

Slide 5

**Aandacht**

- Concentratieve aandacht: het hebben van een focus op een specifiek object/gebeurtenis.
- Receptieve aandacht: open aandacht voor het hele veld van ervaringen zonder limitatie.

**Attention**

- Concentrative attention: focussing on a specific object/event.
- Receptive attention: focussing on everything in the environment, without limitations.

Slide 6

Wat zie je hier?



- Selectieve aandacht: het vermogen je aandacht te richten op relevante informatie en irrelevante informatie te onderdrukken

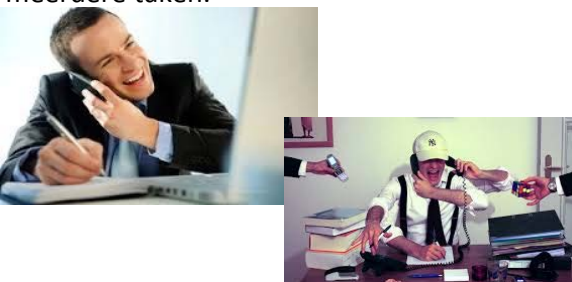
**What do you see in this image?**

Selective attention: the ability to focus on relevant information and to ignore irrelevant information.

Slide 7

Verdeelde aandacht

- Vermogen om je aandacht te verdelen onder meerdere taken.



**Divided attention**

The ability to focus on multiple things at the same time.

Slide 8

Volgehouden aandacht

- Vermogen je aandacht langdurig ergens op te kunnen richten.


**Sustained attention**

The ability to focus attention on one specific task or activity for a continuous amount of time without being distracted.

Slide 9

**Wat is de functie van aandacht?**

- Informatie organiseren en samenbrengen door in verband te brengen met al aanwezige informatie. We maken een geheel van de som der delen.
- Bewustwording. Zonder aandacht, geen bewustzijn.
- Zonder bewustzijn geen taal. Via taal hebben we de mogelijkheid om na te denken en te spreken over situaties/fenomenen. Hierdoor: mogelijkheid abstract te redeneren en subjectieve betekenis te geven.

**What is the function of attention?**

- Organising and pooling new information by connecting it to information that is already available. We make a whole of the sum of its parts.
- Awareness. No awareness, without attention.
- No language, without awareness. Languages allows us to think and talk about situations/phenomena. As a result, abstract reasoning and proving subjective meanings.

Slide 10

**Functie van aandacht**

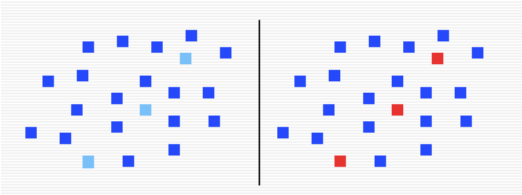
- [https://www.youtube.com/watch?v=5odWky\\_mORMw](https://www.youtube.com/watch?v=5odWky_mORMw).
- Zonder aandacht, kan je je niet bewustzijn van iets.
- Waarop je je aandacht richt of kan richten bepaald in grote mate je wereldbeeld.

**The function of attention**

- To become aware of certain information, attention is necessary.
- Our world view largely depends on where we focus our attention on.

Slide 11

**Pop out effect**



Onze aandacht wordt vaak onwillekeurig getrokken. Zonder training is het moeilijk zelf sturing te geven aan de allocatie van aandacht.

**Pop-out effect**

Often information attracts our attention involuntary. Without training, it is difficult to steer the focus of attention.

Slide 12

**Beperkte aandacht**

- Oorzaken: o.a. slecht slapen, stress, ongetraind/ongebruikt.
- Gevolgen:
  - Snel en vaak afgeleid,
  - Moeite lang op een activiteit te kunnen concentreren,
  - Verminderde prestaties,
  - Meer moeite met inslapen,
  - Minder 'open' in sociale contacten,
  - Minder gefocust (Wallace, 2006).

**Limited attention**

- Causes: e.g. poor quality of sleep, stress, untrained/neglect.
- Consequences:
  - Easily and often distracted,
  - Difficulties with concentrating on one thing for a long period of time.
  - Impaired performance,
  - Having trouble falling asleep at night,
  - A more closed attitude,
  - Less focussed.

Slide 13

**Trainen van aandacht**

- Zoals veel cognitieve vaardigheden kan de aandachtspanne versterken door training!



- Peng, P., & Miller, A.C. (2016)

**Attention training**

Like many cognitive abilities, the attention span can be improved through training!

Slide 14

**Waarom trainen van aandacht?**

- Waarneming: negeren en aandacht voor bepaalde informatie,
- Genegeerde informatie lijkt niet te bestaan of onbelangrijk,
- We kiezen (onbewust) waar aandacht naar uitgaat,
- Realiteitsperceptie: afhankelijk van waar onze aandacht op gericht is,
- Realiteitsperceptie bepaald onze keuzes en gedrag (Lampert et al., 2015; Wallace, 2006).

**Why attention training?**

- Observation: Ignoring and paying attention to certain information,
- Information that is ignored does not seem to exist or seems irrelevant,
- We choose (unconsciously) where we focus attention on,
- Perception of reality: depends on where we focus attention on and determines choices and behaviour.

Slide 15

**Voordelen**

- Verbeterde concentratie,
- Sneller signaleren fysieke en mentale overbelasting, spanning,
- Minder neiging tot piekeren,
- Stress reductie,
- Hogere weerbaarheid,
- Vergroten van creativiteit, out of the box denken/handelen,
- Meer open houding, verbeterde communicatie en verstandhouding (Arch, Landy, Brown, Creswell & Ryan, 2015; Charoensukmonkol, 2014; Davis & Hayes, 2011).

**Benefits**

- Improved ability to concentrate,
- Identifying stress, physical and mental overloading faster,
- Less tendency to worry,
- Stress reduction,
- Increased resilience,
- Greater creativity, out-of-the-box thinking/acting,
- Increased open attitude, improved communication and relationships.

Slide 16

**Oefeningen**


- Er bestaan verschillende oefeningen om aandacht te trainen (ontwikkeld door o.a. Alan Wallace, 2006).
- Body scan
- Ademhalingsoefening

**Exercises**

- There are a variety of exercises to train attention (e.g. exercises developed by Alan Wallace, 2006)
- Body Scan
- Breathing Exercise

Slide 17

Oefeningen (De Haas, 2007; Wallace, 2006) en  
aandachtstaak (Brickenkamp et al., 1998)

**Exercises and test of attention**

What one gives attention grows.

Slide 18

Afronding

**Conclusion**Keep calm and thank you for your  
attention.

*Figure 1.* PowerPoint slides used for the presentation about attention during the brief mindfulness instruction.