

**Mindfulness and health behaviour:
Examining the roles of attention regulation and decentering**

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Abstract

This chapter examines how mindfulness interventions affect health behaviour through attention regulation and decentering. Specifically, mindfulness may be effective to the degree that attention training increases one's ability to accurately detect temptation cues, to direct attention in ways that support self-control, and to monitor one's behaviour. In addition, the decentering component of mindfulness allows one to view the reward simulations that lead to desire as mere mental events, making tempting stimuli less inherently attractive, and thus preventing impulses and cravings. This analysis is illustrated with research on eating, smoking, and drinking, and may contribute to a more detailed understanding of mindfulness mechanisms and support their most effective application.

Since the introduction of mindfulness-based stress reduction by Kabat-Zinn (1982), mindfulness-based interventions have been shown to be effective for dealing with a variety of conditions like stress and anxiety, and to generally improve psychological well-being (for reviews, see Baer, 2003; Goyal, Singh, Sibinga, & et al, 2014; Grossman, Niemann, Schmidt, & Walach, 2004). More recently, mindfulness has also gained increasing interest with regard to health behaviours, for example eating, smoking, and alcohol use. Similarly, mindfulness has become increasingly popular as a tool for initiating behaviour change, both by lay individuals who study mindfulness from self-help books or courses, and by scientists who investigate the effects of mindfulness-based interventions systematically. While this work has suggested that mindfulness is a powerful approach to stimulate healthy behaviour, we only have limited insights into the psychological mechanisms underlying these effects. Therefore, the current chapter presents a review of recent work on mindfulness and health behaviour particularly with a view to elucidating its underlying mechanisms. This may contribute to both further systematic research as well as targeted applications of mindfulness to facilitate health behaviour change.

For the sake of the current analysis and based on existing conceptualizations (Bishop et al., 2004; Lutz, Jha, Dunne, & Saron, 2015), mindfulness will be regarded as a state that is characterized by two components, namely (1) the regulation of attention, and (2) metacognitive awareness and insight into the nature of one's experiences, which allows one to view them in a nonjudgmental manner as "passing events in the mind" (Bishop et al., 2004, p. 234). Attention regulation refers to the ability to monitor, control, and sustain attention, including maintaining it for an extended period of time on a chosen object. This part of mindfulness is trained in various types of meditation (Lutz, Slagter, Dunne, & Davidson, 2008), also referred to as samatha or concentration practice (Grabovac, Lau, &

Willett, 2011). Typically, meditation in mindfulness training instructs participants to direct their attention to whatever they are experiencing in the present moment, which over time increases one's present-moment awareness (Bishop et al., 2004; Brown & Ryan, 2003).

The second mindfulness component will be referred to as “decentering” here, but it strongly resembles what has been described as “reperceiving”, cognitive insight, or “cognitive defusion” (Chambers, Gullone, & Allen, 2009; Grabovac et al., 2011; Hayes & Wilson, 2003; Shapiro, Carlson, Astin, & Freedman, 2006). While people typically get deeply immersed in their thoughts and experience them as very compelling and real, decentering reflects the meta-cognitive awareness that one's thoughts and experiences are in essence no more than mental events. In other words, decentering refers to the insight that even the most compelling simulations, intense emotions, and realistic thoughts occur only in one's mind, where one can observe them arise and dissipate without having to act on them in any way (see Papiés, Pronk, Keesman, & Barsalou, 2015). Typically, mindfulness training teaches participants this perspective with regard to emotional and physical states they may experience during meditation practice and in daily life, which facilitates acceptance and non-reactivity to both pleasant and unpleasant experiences (Grabovac et al., 2011).

This chapter will first briefly review how comprehensive mindfulness interventions as well as self-reported mindfulness skills reflecting both of these components have been shown to affect health behaviour. Then, critical processes in the regulation of health behaviour will be laid out, and next we will discuss studies investigating effects of attention processes and decentering on these processes separately. Finally, we will turn to the ways that attention regulation and decentering interact and complement each other, and to further conclusions and implications.

Effects of comprehensive mindfulness interventions and skills on health behaviour

A significant number of studies to date have shown effects of comprehensive mindfulness interventions and of mindfulness-related skills on health behaviour. Let us first briefly discuss findings in the domain of eating and weight control, and then turn to research on smoking and alcohol use. It should be noted that the literature review in this chapter is not designed to be exhaustive, but rather to illustrate the developments in the field and the potential mechanisms underlying mindfulness effects. In addition, the domains of eating behaviour, smoking, and alcohol use simply serve to illustrate basic processes that are most likely applicable to other health behaviours as well.

Eating behaviour

A number of studies have shown that mindfulness interventions can lead to healthier eating patterns among both healthy and eating-disordered participants. In one experiment among healthy participants, for example, a brief laboratory training that focused on both awareness during eating and on developing a nonjudgmental attitude, led to a reduction in impulsive choices in a delay-discounting task, compared to a nutrition information control condition (Hendrickson & Rasmussen, 2013). Similarly, brief body scan exercises combining attention regulation with a nonjudgmental attitude have been shown to prevent overeating on attractive but unhealthy foods in a laboratory context (Jordan, Wang, Donatoni, & Meier, 2014; Marchiori & Papies, 2014). In line with these experimental findings, correlational studies have shown that individual differences in skills that reflect mindfulness, such as eating and responding to food cues with awareness, are associated with reduced intake of unhealthy foods and lower body mass index (Beshara, Hutchinson, & Wilson, 2013; Framson et al., 2009; Jordan et al., 2014). Together, these findings suggest that mindfulness skills can reduce the appeal of unhealthy food temptations among healthy individuals.

Among participants with disordered eating, Alberts and colleagues have shown that in comparison to a wait-list control group, participants who received a mindfulness-based intervention displayed reduced food cravings and problematic food-related thinking after an 8-week period (Alberts, Thewissen, & Raes, 2012). The mindfulness intervention contained both an attention regulation component, such as increasing awareness of thoughts, physical states, and eating-related sensations, and an attitudinal component promoting a non-judging approach to one's experiences. Focusing specifically on patients with binge-eating disorder, Kristeller and colleagues showed similar mindfulness-based interventions to reduce binge eating and associated pathology (Kristeller & Hallett, 1999; Kristeller, Wolever, & Sheets, 2014; see Wanden-Berghe, Sanz-Valero, & Wanden-Berghe, 2010, for a review of further, small-scale studies). Synthesizing these literatures, O'Reilly and colleagues (2014) and Katterman and colleagues (2014) reviewed about 20 studies that included mindfulness components targeted at eating behaviour, and found that the majority reported improvements in disordered eating, and to a lesser degree, reductions in body weight.

Smoking and alcohol use

Fewer but similar findings have been reported in the areas of smoking and alcohol use (see also Chiesa & Serretti, 2014, for a systematic review across substance abuse disorders). Brewer and colleagues (2011), for example, showed that a mindfulness intervention containing both attention and decentering elements (e.g., awareness of craving cues, adopting a non-judgmental perspective) reduced cigarette consumption among smokers motivated to quit more than among participants in a control intervention. Bowen and Marlatt (2009) showed that applying mindfulness principles to dealing with cue-elicited cravings reduced smoking over a 7-day follow-up period, and it weakened the association between smoking urges and actual smoking. Elwafi et al. (2013) further showed that this craving-smoking link reduction was stronger for participants who applied mindfulness principles more in their daily

lives during the four weeks of the treatment. In a more recent study, Ruscio and colleagues showed that a brief, 3-session mindfulness intervention, again providing instructions for attention regulation as well as for decentering, reduced negative affect, cravings, and numbers of cigarettes smoked over a 2-week period, compared to an active control condition (Ruscio, Muench, Brede, & Waters, 2015). In the domain of alcohol use, Brewer et al. (2009) and Garland et al. (2010) found reduced reactivity to typical triggers of alcohol use, such as descriptions of stressful events and pictures of alcohol, among participants who had completed a mindfulness intervention, and a negative association of trait mindfulness with attentional bias for alcohol cues (Garland, Boettiger, Gaylord, Chanon, & Howard, 2012). Extending this to behavioral effects, a large randomized clinical trial showed that mindfulness-based relapse prevention reduced substance use and heavy drinking at 12-month follow-up, compared to control treatments (Bowen, Witkiewitz, Clifasefi, & et al, 2014).

Levin and colleagues (2015) recently reviewed work showing a decoupling between typical triggers of smoking and alcohol use, such as negative affect and cravings, and actual use of these substances. They identified a small number of studies in which a mindfulness-based intervention or trait mindfulness skills modulated the link between such triggers and substance use, suggesting that mindfulness can indeed change the effects of one's internal experiences, such as cravings, on behaviour.

Although the effect of mindfulness in these studies are sometimes weak and limited by methodological concerns (see Chiesa & Serretti, 2014), these studies on comprehensive mindfulness interventions suggest that mindfulness can have beneficial effects on health behaviour, for example by reducing problematic eating behaviour and decreasing the effects of cravings on cigarettes and alcohol use. How do mindfulness interventions work to achieve these effects?

Potential roles for attention regulation and decentering in health behaviour

To understand the mechanisms by which mindfulness could affect health behaviour, let us first consider some critical processes in the regulation of health behaviour, and then discuss how the mindfulness components of attention regulation and decentering could affect them (for similar analyses of how comprehensive mindfulness interventions can target addictive behaviours, see for example Brewer, Elwafi, & Davis, 2012; Witkiewitz, Marlatt, & Walker, 2005).

Recent research shows how people often automatically act on short-term rewards, despite the best long-term intentions (e.g., Hofmann, Friese, & Wiers, 2008; Webb & Sheeran, 2006). Impulsive and also addictive behaviours to obtain short-term rewards are typically triggered by an environmental cue, for example the smell of tasty food, or by an internal state, such as feeling stressed. Often, such cues go unnoticed, and the processes by which they affect health behaviour are automatic in the sense of being unintentional and occurring outside of conscious awareness (e.g., Barsalou, this volume; Papies, 2016; Papies & Barsalou, 2015). As a result, for example, seeing tasty food in a deli window can trigger buying and eating a rich piece of cake, despite one's dieting intentions and in the absence of hunger.

Successful health behaviour therefore relies on effective monitoring of internal and external cues, making it more likely that a person will become aware of the cues and processes affecting their behaviour, so that more deliberate courses of action become possible (see also Elkins-Brown, Teper, & Inzlicht, this volume). With effective monitoring, one can detect when a tempting situation arises and can prepare appropriate action, for example walking away from a drinking contest at a party, in order to prevent binge drinking (see Hagger et al., 2011). Similarly, monitoring can entail assessing one's behaviour in relation to one's standards, for example comparing one's food intake to one's eating goals, in order to

prevent mindless overeating on tasty food (see Versluis & Papies, 2016; Ward & Mann, 2000).

In many cases, however, internal or external cues trigger a desire or conscious craving for a certain substance that is hard to simply walk away from, especially in case of an addiction (for a reviews, see for example Kavanagh, Andrade, & May, 2005; Witkiewitz et al., 2005). Desire and cravings have been described as the motivation and strong urge, respectively, to consume a certain substance, arising from expectations of reward based on earlier consumptive experiences (e.g., Brewer et al., 2012; Kavanagh et al., 2005; Papies & Barsalou, 2015). Once representations of rewarding consumption experiences have been established, the mere exposure to a cue associated with enjoying tempting food, smoking, or drinking alcohol, can be enough to trigger a vivid and seemingly “real” simulation of consuming and enjoying the substance, leading to the experience of desire and possibly, to actual consumption behavior (Papies & Barsalou, 2015). Crucially, applying a decentered perspective to these simulations can make them less subjectively real and compelling, or in Buddhist terms, “empty”. In other words, realizing that these simulations, as vivid and rewarding as they may seem, are merely mental events that will dissipate naturally, can reduce their motivational power.

When cravings do arise, healthy choices may still result from trying to counter them with thoughts of the conflicting goal (Papies, Stroebe, & Aarts, 2008), or again, from applying a decentered perspective to one’s desire thoughts by realizing their nature as mere mental events that will dissipate naturally. Executive attention, or the ability to control one’s attention, may then again be important to maintain the decentered perspective as well as information about the desired behaviour in working memory, and to shield it from interference from undesired response tendencies (Engle, 2002; Hofmann, Gschwendner, Friese, Wiers, & Schmitt, 2008).

As this brief analysis has shown, the mindfulness components of attention regulation and decentering could affect the processes that regulate health behaviour at various points. Attentional processes can support the detection of tempting cues, the monitoring of one's behaviour, and the activation and maintenance of one's long-term goals. Decentering can prevent the development of desire from reward cues at various points, as one sees that one's rewarding simulations of consuming the substance are mere mental events. Further, decentering can help to reduce desire and prevent its effects on behaviour in those cases where it did develop, thus decoupling the link between desire and behaviour as was described above.

Importantly, the present analysis suggests specific effects of these mindfulness components on processes that underlie health behaviour. So far, however, no research has tested this account directly and comprehensively. The studies described in the first part of this chapter contained elements that most likely affected both mindfulness components, so that their respective contributions to the effects on health behaviours cannot be inferred. The work described in the next sections speaks more directly to the effects of attention regulation and decentering on health behaviour, even if not all of it was designed to specifically examine mindfulness effects.

Attention regulation and decentering as mindfulness mechanisms

For both attentional processes and decentering, let us now look at how each of these components is affected by mindfulness training, then how they affect health behavior, and finally, how these mechanisms could be underlying the mindfulness effects on health behavior that are reported in the literature.

Attention regulation

A large number of studies has shown that mindfulness training influences attentional processes. To name a few examples, mindfulness meditation has been found to improve the

orienting of attention (Jha, Krompinger, & Baime, 2007), the processing of interoceptive signals (Farb, Segal, & Anderson, 2013), attentional control (e.g., Chambers, Lo, & Allen, 2008; Moore, Gruber, Derose, & Malinowski, 2012), and sustained attention (Zeidan, Johnson, Diamond, David, & Goolkasian, 2010). Recent reviews and a meta-analysis have confirmed such findings across studies and shown that mindfulness meditation improves core attentional processes (Chiesa, Calati, & Serretti, 2011; Sedlmeier et al., 2012). These processes parallel those that are trained during a session of concentrative meditation practice where one directs attention to a chosen object, maintains attention, and responds to mind-wandering by bringing attention back to the chosen object (see Hasenkamp, Wilson-Mendenhall, Duncan, & Barsalou, 2012).

Research has also shown that these attentional processes affect health behaviour in critical ways. Individuals with better executive attention, for example, are better able to override their impulses and act in line with long-term goals, such as dieting (Hofmann, Gschwendner, et al., 2008), as are individuals who have completed a mindfulness training (Ostafin, Bauer, & Myxter, 2012). Reduced attention during eating decreases taste sensitivity (van der Wal & van Dillen, 2013) and increases unhealthy intake (Ward & Mann, 2000). In contrast, directing attention toward one's eating can prevent later overeating (Higgs & Donohoe, 2011), and training to systematically direct attention away from tempting food cues can reduce cravings and consumption (Kemps, Tiggemann, Orr, & Gear, 2014). Training attention away from tempting cues seems less effective in the domains of alcohol and smoking, but findings do suggest that repeatedly directing attention *toward* alcohol and tobacco cues can *increase* craving and consumption among heavy users (Field & Eastwood, 2005; Schoenmakers et al., 2010). Selective attention toward substance-related cues has been found to be a predictor of craving more generally (Franken, 2003), again pointing to the central role of attentional processes.

In line with the analysis of health behaviour presented above, these findings indicate that the way an individual directs and regulates attention in a tempting environment can be of critical importance for health behaviour. Thus, mindfulness may be effective because the attention regulation component of mindfulness increases one's ability to accurately detect internal and external cues that trigger craving, to direct attention away from desire-inducing and toward desire-reducing information, and to keep one's long-term goals in mind. Although awaiting direct empirical testing, this account may explain how mindfulness interventions affect health behaviour through improved attention regulation skills.

Decentering

Less research has focused specifically on the decentering component of mindfulness. However, a number of studies show that mindfulness is associated with increased decentering as assessed by self-report measures (Davis, Lau, & Cairns, 2009; Hayes-Skelton & Graham, 2013; Lau et al., 2006), and that completing a mindfulness training increases decentering abilities (Hoge et al., 2014; Lau et al., 2006). Whereas no clear behavioral or neural markers of decentering currently exist, research further suggests that mindfulness training alters the processing of emotional stimuli in ways that are consistent with less intense and reactive processing, in line with a decentered perspective (Desbordes et al., 2012; Hölzel et al., 2013; Lebois et al., 2015; Ostafin, Brooks, & Laitem, 2014). These processes again parallel those that are trained during mindfulness practice and in various schools of meditation, as one practices the capacity to break the "time traveling" and subjective realism that typically characterizes our mental experiences (Dunne, 2011; Papies, Barsalou, & Custers, 2012).

Importantly, a number of experimental studies have recently demonstrated the effects of decentering on health-related cognition and behavior. In the domain of eating behavior, Papies and colleagues (2012, 2015) have shown that teaching non-meditators to apply a decentered perspective by observing their responses to food pictures as mere mental events

can reduce approach impulses toward tempting food as well as actual unhealthy choices and eating behavior, especially among hungry participants. In other words, once participants realized that the eating and enjoyment thoughts that the food pictures typically trigger are merely mental events, the desire for these foods was strongly reduced, and resisting them became easier. Jenkins and Tapper (2014) showed that applying such a decentering perspective to chocolate helped participants reduce chocolate intake over a 5-day period, and Lacaille and colleagues (2014) demonstrated that training decentering was more effective than other mindfulness-based skills in preventing and reducing chocolate craving. Similar approaches, based on the so-called urge-surfing technique where one learns to accept one's cravings and let them naturally dissipate, have been shown to be beneficial in the domain of smoking (Rogojanski, Vettese, & Antony, 2011). Finally, correlational studies suggest that decentering skills are related to reduced food cravings in experienced meditators (Keesman, Papiés, Aarts, & Häfner, 2016; Papiés, van Winckel, & Keesman, 2016).

Again in line with the analysis of health behaviour presented above, these findings indicate that the ability to apply a decentered perspective to tempting stimuli can be of critical importance for health behaviour. Mindfulness training may be effective as the decentering component increases one's ability to view the reward-related thoughts that typically lead to full-blown cravings as mere mental events. Realizing that the reward anticipated from consumption is merely a passing mental state makes a tempting stimulus much less inherently attractive, and can prevent impulses and cravings. As a result, deliberate processes supporting one's long-term goals are more likely to affect behaviour. In addition, applying decentering repeatedly may lead to a lasting change in the representation of tempting stimuli, so that they will be less likely to activate rewarding consumption simulations later (Barsalou, this volume; Papiés et al., 2015). Although again awaiting direct empirical testing, this

account may explain how mindfulness interventions affect health behaviour through decentering skills.

Interactions of attention regulation and decentering

So far, we have looked mainly at the separate roles of attention regulation and decentering skills in health behaviour. In actual mindfulness training, however, these two skills complement and support each other and are typically trained together, and it seems likely that such interactions also occur in health behaviour (Papies et al., 2015). As suggested in Papies et al. (2015), training attention regulation will be much easier if combined with the insight of decentering. During meditation practice, distractions will inevitably arise, for example while one is focusing attention on one's breath. Applying decentering will allow one to perceive such distractions as mere mental events, making it less likely to get caught up in them and thus easier to return to one's chosen object of attention. This way, decentering can facilitate the training of attention regulation during meditation practice, or "on the cushion". In a similar manner, decentering can support the application of attention regulation skills in one's daily life, or "off the cushion". As an example, consider a dinner party with good conversation and attractive food. Here, keeping one's overall health goals in mind so that one can consistently pursue them will be easier if one applies decentering and thus perceives food temptations which would otherwise lead to unhealthy behaviours as less inherently attractive.

Conversely, it can be argued that good skills at attention regulation support both the training and the real-life application of decentering. While research has shown that decentering can be learned and applied by non-meditators after a very brief training (e.g., Jenkins & Tapper, 2014; Papies et al., 2012, 2015), the application of this perspective over an extended period of time will benefit from good skills at attention regulation. In particular, maintaining a decentred perspective during one's meditation means that a particular

processing mode has to be kept active in working memory in order to apply it directly to distractions as they arise, before one gets carried off in associative thought. Similarly, applying decentering in real-world situations without being prompted to do so by an experimenter or mindfulness trainer and while being exposed to various distractions is much easier if supported by good attentional skills. These will facilitate both the detection of critical opportunities to apply decentering, as well as the return to a decentered perspective after possible interruptions (see also Hasenkamp et al., 2012).

As this brief discussion illustrates, attention regulation and decentering seem to play unique roles in the effects of mindfulness interventions on health behaviour, but they also support and complement each other. Thus, while an analysis of these separate components is useful for understanding the mechanisms of mindfulness, and targeted applications of these components may be useful for particular issues (see Papies et al., 2015), mindfulness may in most cases be applied most effectively if both decentering and attention regulation skills are trained.

Domain-specificity of mindfulness effects

Most of the mindfulness interventions described here were targeted toward a specific behaviour and delivered with a particular long-term goal in mind, for example to reduce alcohol consumption or food cravings. While these domain-specific interventions have demonstrated promising effects, a critical look at the literature suggests that general mindfulness programs (e.g., MBSR), have only limited effects on specific health behaviours. Indeed, a recent meta-analysis found evidence for effectiveness of these programs for dealing with depression, pain, and anxiety, but no effects on specific outcomes that were not targeted directly by the programs, like healthy eating behaviours and body weight (Goyal et al., 2014). Thus, mindfulness interventions for health behaviour may be most effective if they are targeted at a specific domain.

One possible reason for this mindfulness specificity may be a person's motivation to change (see also Karremans & Kappen, this volume). A participant in a stress-reduction program, for example, may not be particularly motivated to reduce smoking and lose weight, in addition to dealing with stress, so that changes on such specific behaviours are less likely to occur. Alternatively, participants may not realize that the skills they learn for example for dealing with stress and negative affect, can also help them deal with reward-related issues, like cravings and desires.

Finally, the mechanisms potentially underlying the mindfulness effects as discussed above may also help us understand why mindfulness works best if it is delivered in a domain-specific way. A specific mindfulness training is more likely to include practices that train participants in becoming aware of the relevant internal and external cues affecting their behaviour, for example the cues that trigger cigarette craving, or that precipitate overeating. Similarly, a domain-specific training is more likely to be effective for developing decentering skills for exactly those cravings that challenge participants most, for example by having participants apply it directly to the thoughts and sensations associated with cigarette cravings (see, for example, the application of the urge-surfing technique in Bowen & Marlatt, 2009). In other words, both attention regulation and decentering may be most effective if they are situated (see Papies, 2016), such that they are trained in a domain that is relevant to participants, and if the content that these skills are trained on is critical to the problems that participants experience.

It should be noted that a few studies have shown associations between general mindfulness skills and specific health behaviours or their predictors. A brief, general mindfulness training, for example, reduced the effect of automatic processes on alcohol thoughts and drinking behaviour (Ostafin et al., 2012) and lead to healthier eating (Jordan et al., 2014), and self-reported general mindfulness was associated with stronger enactment of

one's physical activity intentions (Chatzisarantis & Hagger, 2007), and with a reduced tendency to eat in response to stress and strong emotions (Pidgeon, Lacota, & Champion, 2012). The findings on the domain specificity of mindfulness, however, suggest that such effects might be stronger if mindfulness skills were trained or assessed specifically with regard to the critical health behaviours under study.

Summary and Conclusions

In this chapter, we have examined how mindfulness interventions may affect health behaviour through affecting attention regulation and decentering. By analyzing the processes that underlie the regulation of health behaviour, such as the detection of tempting cues, the maintenance of health goals in working memory, and the prevention and regulation of craving, we have seen that mindfulness effects can be understood as effects of either attention regulation, or the application of a decentered perspective to temptations. Although various lines of research support this account in indirect ways, future research should examine these mechanisms directly, so that a more detailed understanding of mindfulness mechanisms can further support their most effective application.

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