



Dissociation between the cognitive and interoceptive components of mindfulness in the treatment of chronic worry



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ABSTRACT

Objectives: Despite the increasing interest in mindfulness, the basic components and action mechanisms of mindfulness remain controversial. The present study aims at testing the specific contribution of two components of mindfulness -attention to cognitive experience (*metacognition*) and awareness of interoceptive sensations (*metainteroception*)- in the treatment of chronic worry.

Method: Forty five female university students with high scores in the Penn State Worry Questionnaire were split into three groups: a mindfulness cognitive training group, a mindfulness interoceptive training group, and a non-intervention control group. Participants were assessed before and after the intervention using physiological indices of autonomic regulation (skin conductance, heart rate, heart rate variability, and respiratory sinus arrhythmia) and self-report indices of mindfulness and clinical symptoms (chronic worry, depression, positive and negative affect, and perceived stress).

Results: Both mindfulness training groups showed significant improvement after the intervention in self-report indices of mindfulness and clinical symptoms. However, the interoceptive training group was superior in also showing significant improvement in the physiological indices of autonomic regulation.

Limitations: The relatively small sample size may have increased the probabilities of type I and II errors. Our Intervention program was relatively short. The participants were all female.

Conclusions: These results support the hypothesis that, in the context of treating chronic worry, the interoceptive and cognitive components can be somewhat dissociated and that, when both components are applied separately, compared to a non-intervention condition, the interoceptive component is more effective.

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1. Introduction

In recent years, reports of the beneficial effects of mindfulness applications in a variety of contexts, including the treatment of psychological and stress-related disorders, have proliferated (Allen et al., 2006; Baer, 2003; Grossman, Niemann, Schmidt, & Walach, 2004). There are also several outcome studies that have combined mindfulness skills and cognitive behaviour therapy (CBT) and reported positive results in the treatment of anxiety disorders (Roemer, Williston, Eustis, & Orsillo, 2013), depression (Kuyken

et al., 2008), addiction (Zgierska et al., 2009), and personality disorders (Linehan, 1993), among others. However, for some critics, the integration of mindfulness into CBT lacks the support of sufficient scientific evidence (Carmody, 2009). Few studies have specifically sought to identify which action mechanisms underlying the practice of mindfulness are truly effective in producing the reported outcomes. Moreover, despite the increasing interest in mindfulness, there is still little consensus among researchers about the basic components and action mechanisms of mindfulness.

Bishop et al. (2004) distinguished two fundamental components of mindfulness: the regulation of attention to focus it on the present experience; and an attitude of curiosity, openness, and acceptance of that experience. Baer (2003) proposed five components of mindfulness: exposure, cognitive change, self-management, relaxation, and acceptance. Shapiro, Carlson, Astin, and Freedman (2006) suggested that mindfulness has three key components:

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attention, intention, and attitude. Brown, Ryan, and Creswell (2007) also proposed five components of mindfulness: insight, exposure, non-attachment, enhanced mind-body functioning, and integrated functioning. More recently, Hölzel et al. (2011) considered the following four components: attention regulation, body awareness, emotion regulation (including re-appraisal and exposure, extinction, and reconsolidation), and change in perspective of the self. Additionally, some researchers have proposed that a variety of action mechanisms underlie the practice of mindfulness, such as re-perceiving (Shapiro et al., 2006), decentering (Segal, Williams, & Teasdale, 2002), and self-compassion (Kuyken et al., 2010). Undoubtedly, this conceptual diversity, sometimes confounding components and effects of mindfulness, makes the investigation of mindfulness complex and hinders the consistency of the construct.

In one of the few studies aimed at disentangling the cognitive and affective components of mindfulness, Sears and kraus (2009) developed two interventions that focused on either attention (i.e., awareness of the breath, sounds and bodily sensations and a stance of accepting whatever arises) or emotion (i.e., loving kindness that includes extending friendliness, compassion, joy, and peacefulness to the self and others). These authors compared these two interventions to a non-intervention control condition and a combination condition (attention + loving kindness). They reported greater benefits of the combination condition in the self-report measures of anxiety, negative affect, hope and irrational beliefs. However, the study failed to show the expected dissociation between the cognitive and affective components of mindfulness. No significant differences were found between the three intervention conditions. Moreover, the durations of the interventions were a confounding variable because the duration of the combination condition was longer than that of the other two interventions.

The present study sought to further investigate the specific contributions of the cognitive and emotional aspects of mindfulness by focussing on two different components: (a) attention to cognitive experience (*metacognition*) and (b) awareness of interoceptive sensations (*metainteroception*). Hölzel et al. (2011) referred to these components as *cognitive control of attention* and *body awareness* and provided empirical evidence that suggests that these components are linked to different neural substrates. The *cognitive control of attention* is thought to be linked to the anterior cingulate cortex (Van Veen & Carter, 2002) and the fronto-insular cortex (Sridharan, Levitin, & Menon, 2008), whereas *body awareness* is thought to be closely related to the insula (Craig, 2003; Hölzel et al., 2008) and the secondary somatosensory cortex (Gard et al., 2012). If the above interpretation is correct, then the cognitive and interoceptive components of mindfulness, i.e., attention and awareness of cognitive versus interoceptive phenomena, should be dissociable through appropriate manipulation of the training procedures. The present study aimed to test this dissociation, defined as the separation of the cognitive and the interoceptive components of mindfulness, by examining their differential effects in the treatment of chronic worry (hypothesis 1).

Chronic worry was selected for two reasons. First, there is evidence that the combination of the cognitive and interoceptive components of mindfulness in the treatment of chronic worry results in significant clinical improvements (Delgado et al., 2010). Second, there are alternative conceptual models of the psychopathology and treatment of chronic worry that separately emphasise the relevance of each of these components. For example, Borkovec's model (Borkovec, Alcaine, & Behar, 2004) considers chronic worry to be a cognitive avoidance response to perceived threats that has been learned because worry momentarily suppresses the aversive somatic experience of anxiety. From this perspective, mindfulness training based on the interoceptive component might facilitate

extinction of the avoidance mechanism by calmly acknowledging and accepting the somatic experience of anxiety. Alternative models, such as the uncertainty intolerance model (Dugas, Gagnon, Ladouceur, & Freeston, 1998) and the metacognitive vulnerability model (Wells, 2005), explain chronic worry as a consequence of a cognitive deficit associated with negative thoughts and beliefs. Wells' model emphasizes the presence of meta-worries, a characteristic that has been demonstrated that applies to both clinical and non-clinical worriers (De Bruin, Rassin & Muris, 2007). From this perspective, mindfulness training based on the cognitive component might be beneficial via the attenuation of cognitive vulnerability or the breaking of the vicious circle of meta-concerns. The present study also aimed to test the hypothesis that the interoceptive training is more effective than the cognitive training in reducing chronic worry, thus supporting indirectly the prediction from Borkovec's model rather than the prediction from alternative cognitive models (hypothesis 2).

2. Method

2.1. Participants

The participants were 45 female university students with a mean age of 21.5 years ($SD = 3.94$) and high scores on the *Penn State Worry Questionnaire* (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990). The participants were selected from an initial pool of 531 students who completed the questionnaire. Inclusion criteria were: (a) to score above the 80th percentile in this pool ($M = 67.46$, $SD = 4.3$, range = 62–78) and (b) to be female university student, caucasian, and between 18 and 30 years old. Exclusion criteria were: (a) to suffer generalised anxiety disorder (GAD), (b) to be undergoing any psychological or pharmacological treatment, and (c) to have any cardiovascular problem. All participants were screened using the *Anxiety Disorders Interview Schedule* (ADIS-IV; Brown, Di Nardo, & Barlow, 1994) to guarantee that no participants suffered from generalised anxiety disorder (GAD) in order to increase the homogeneity of our student sample. Only 2 participants did not pass the screening procedure for this reason.

2.2. Design

The participants were randomly assigned to one of the following three groups: a mindfulness cognitive training group, a mindfulness interoceptive training group, and a non-intervention control group. The training comprised two 1-h sessions per week over three weeks. All participants underwent psychological and psychophysiological assessment procedures prior to and after the intervention. Four participants (three in the mindfulness cognitive training group and one in the control group) discontinued participation. The final numbers of participants were 15 in the mindfulness interoceptive training group, 12 in the mindfulness cognitive training group and 14 in the control group. Sample size was estimated appropriate based on treatment studies of chronic worry that employed similar psychophysiological measures (Delgado et al., 2010; Stapinski, Abbott, & Rapee, 2010). The assessment and the training procedure were carried out for the three groups during the same academic time period. It should be noted, however, that the post-intervention assessment was closer to the final exams, a condition that might have increased the stress level in all groups.

2.3. Assessment procedure

2.3.1. Self-report measures

The participants completed the following questionnaires prior to and after the intervention program: (a) *Penn State Worry*

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