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Relating Differently to Intrusive Images: the Impact of Mindfulness-Based Cognitive Therapy (MBCT) on Intrusive Images in Patients with Severe Health Anxiety (Hypochondriasis)

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Abstract Recurrent distressing intrusive images are a common experience in hypochondriasis. The aim of the current study was to assess the impact of mindfulness-based cognitive therapy (MBCT) for hypochondriasis on the occurrence and nature of distressing intrusive imagery in hypochondriasis. A semistructured interview was used to assess intrusive imagery, and an adapted version of the Southampton Mindfulness Questionnaire (SMQ) was used to assess participants' relationship with their intrusive images. A consecutive series of participants (N=20) who were receiving MBCT for hypochondriasis as part of an ongoing research program were assessed prior to participating in an 8-week MBCT intervention, immediately following the intervention, and at 3-month follow-up. As compared to the baseline assessment, the frequency of intrusive images, the distress associated with them, and the intrusiveness of the images were all significantly reduced at the post-MBCT assessment. Participants' adapted SMQ scores were significantly increased following the MBCT intervention, suggesting that participants' relationship with their intrusive images had changed in that they had developed a more "mindful" and compassionate response to the images when they did occur. Effect sizes from pre- to post-intervention were medium to large (Cohen's d=0.75–1.50). All treatment gains were maintained at 3-month follow-up. Results suggest that MBCT may be an effective intervention for addressing intrusive imagery in hypochondriasis.

Keywords Health anxiety · Hypochondriasis · Imagery · Mindfulness · MBCT

Introduction

Health anxiety exists on a continuum with severe health anxiety being diagnosed as "hypochondriasis" (*DSM-V*: American Psychiatric Association 2013) or "hypochondriacal disorder" (*ICD-10*: World Health Organization 1992). Up to 9 % of patients in general medical practice clinics and up to 5 % of the general population meet diagnostic criteria for hypochondriasis (Creed and Barsky 2004; Gureje et al. 1997). Hypochondriasis is characterized by the fear of having a serious disease that persists in spite of appropriate medical reassurance. The condition is not only distressing for the individual but is also costly in terms of higher medical care utilization (Barsky et al. 2001b; Noyes et al. 1994) and occupational disability (Mykletun et al. 2009). Hence, it is a priority for the sake of both sufferers and healthcare providers to address hypochondriasis.

Recent years have seen an increase in research examining the role of imagery across psychiatric disorders, with recurrent intrusive imagery being found to affect the majority of patients with post-traumatic stress disorder (Steil and Ehlers 2000), social phobia (Hackmann et al. 2000), agoraphobia (Day et al. 2004), simple phobia (Pratt et al. 2004), obsessive compulsive disorder (Speckens et al. 2007), bulimia (Somerville et al. 2007), and depression (Patel et al. 2007). Two studies have examined intrusive imagery in health anxiety. An initial study (N=10) reported that health anxious patients commonly

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experience images which are linked to memories of adverse events and center on themes of negative self-evaluation, death, and illness (Wells and Hackmann 1993). A more comprehensive study (N=55) reported over 78 % of participants diagnosed with hypochondriasis to experience recurrent intrusive imagery (Muse et al. 2010). The majority of these images were future orientated (86.1 %) and centered on themes of being diagnosed with and/or dying from a serious illness and the impact of death or serious illness on loved ones. Given that imagining events have a greater impact on emotion than thinking about them verbally (Holmes and Mathews 2005; Holmes et al. 2008), it is unsurprising that participants with hypochondriasis also reported high levels of distress in response to intrusive images.

Intrusive imagery has been demonstrated to play a role in the maintenance of several anxiety disorders (e.g., Brewin et al. 1999; Ehlers and Steil 1995; Hirsch et al. 2006), and preliminary evidence indicates that it may contribute to the maintenance of anxiety about health. Imagining a future event has been shown to increase the perceived probability that the imagined event will occur (Carroll 1978; Sherman et al. 1985). Thus, it is likely that experiencing recurrent, future-oriented images about illness and death maintains the inflated disease conviction seen in patients with hypochondriasis by increasing the individual's estimation that these distressing events (serious illness and/or death) will occur. Furthermore, participants with hypochondriasis report engaging in avoidance, checking, reassurance-seeking, distraction, and rumination in response to experiencing intrusive images (Muse et al. 2010). Such maladaptive responses have been shown to contribute both to the recurrence of intrusive imagery and to the maintenance of anxiety disorders (Salkovskis and Campbell 1994; Speckens et al. 2007; Steil and Ehlers 2000; Ehlers and Steil 1995). Hence, intrusive imagery may maintain hypochondriasis both by increasing belief in the illness content of intrusive images and by prompting maladaptive cycles of responding. Given the recurrent, intrusive, and distressing nature of the imagery experienced by those suffering from hypochondriasis and the role imagery may play in the maintenance of anxiety, it is important that treatments for hypochondriasis address intrusive imagery.

Mindfulness-based cognitive therapy (MBCT) has been suggested as a potential method for indirectly addressing problematic imagery by changing the way individuals relate to such images (Hackmann et al. 2011; Holmes et al. 2007; Holmes and Mathews 2010). MBCT is an 8-week, class-based group intervention which incorporates elements of cognitive-behavioral therapy (CBT) with training in mindfulness meditation (Segal et al. 2002b). Although originally developed as a relapse prevention program for depression, MBCT has since been successfully adapted to treat a number of active mood and anxiety disorders (for reviews, see Hofmann et al. 2010; Piet and Hougaard 2011). Furthermore, initial evidence indicates that MBCT may be an acceptable and effective treatment for hypochondriasis (Lovas and Barsky 2010; McManus et al. 2012; Williams et al. 2011). It is hypothesized that MBCT may have a useful role to play in enabling individuals to recognize images as products of the mind, rather than reflections of reality, thus reducing the threatening nature of the images and the consequent distress (Hackmann et al. 2011; Holmes et al. 2007; McManus et al. 2011). MBCT also encourages participants to step back from and let go of distressing thoughts and images, rather than automatically responding with avoidance, rumination, and worry (Williams 2008). This may enable patients with hypochondriasis to recognize and move away from habitual maladaptive responses that maintain both anxiety and intrusive imagery.

Research examining the way in which MBCT works is still in its infancy (Kocovski et al. 2009; Kuyken et al. 2010). Hence, to date, there has been no prior research examining the impact of MBCT on the frequency or associated distress of intrusive imagery in any disorder. The present study therefore examines the impact of MBCT on the experience of distressing intrusive imagery in hypochondriasis. The primary aim of the study was to test the hypothesis that there would be a reduction in the frequency, intrusiveness, and associated distress of images following MBCT. A secondary aim was to test the hypothesis that participants' self-perceived relationship with images (as measured by an adapted version of the Southampton Mindfulness Questionnaire [SMQ: Chadwick et al. 2008] and by a rating of perceived ability to disengage from or "let go" of images) changed following MBCT.

Method

Participants

A consecutive series of participants (N=24) who were receiving MBCT for hypochondriasis at the Oxford Mindfulness Centre as part of an ongoing research program (McManus et al. 2012), and who had been identified as experiencing health anxiety-related intrusive imagery in a previous study (Muse et al. 2010), were invited to participate in the current study. Twenty responded to the invitation and participated in the current study. Participants were eligible to participate in the MBCT program (and thus eligible for participation in the current study) if they were aged 18–65, were fluent in English, and met *DSM-IV-TR* criteria for the diagnosis of hypochondriasis as the principal diagnosis. The Structured Clinical Interview for DSM-IV Axis I disorders (*SCID-I*; First et al. 2002) was used to establish diagnoses. All diagnostic assessments were audio recorded and 25 % (n=5) were selected at random and rated by a different assessor for reliability, with only one instance of disagreement between assessors (Cohen's Kappa=0.87, p<0.001; Cohen 1960). In line with the DSM-IV-TR criteria, participants were not judged to meet diagnostic

criteria for hypochondriasis if the possibility that their health anxiety was realistic concern about a medical condition could not be excluded. Participants were excluded from the MBCT program and thus the current study if they were actively suicidal or met diagnostic criteria for a psychotic disorder, substance dependence, or bipolar disorder.

Procedure

The study was approved by the local National Health Service Research Ethics Committee. Participants were interviewed about their intrusive imagery and completed self-report questionnaires on three occasions:

1. Pre-intervention—immediately prior to participating in the eight week MBCT program
2. Post-intervention—immediately after completing the MBCT program (i.e., 8 weeks after the pre-treatment assessment)
3. Follow-up—three months after the end of the MBCT classes (i.e., 8 weeks and 3 months [approx. 5 months] after the pre-intervention assessment)

MBCT Treatment Protocol

The MBCT course was delivered in the standard group format in eight 2 hour sessions at weekly intervals (Segal et al. 2002b). The program followed the MBCT protocol for the prevention of depressive relapse as outlined by Segal et al. (2002b) but was modified to focus on health anxiety, rather than depressive symptoms, and on recovery from a current episode, rather than on the prevention of relapse for those in remission from depression. As in MBCT for depressive relapse, the first three sessions focused on teaching meditation practices (body scan, sitting meditation, breathing space, mindful movement) to facilitate participants being able to pay purposeful attention in each moment, without judgment.

The fourth MBCT session has more of a disorder-specific educational focus and thus was more of a departure from the original MBCT program. Cognitive-behavioral models of hypochondriasis (Abramowitz et al. 2001; Warwick and Salkovskis 1990) were used as a basis for discussion of the processes which maintain anxiety about health (e.g., worry, rumination, checking, and reassurance-seeking). The triggers, thoughts, emotions, and behaviors related to health anxiety were discussed, and the use of mindfulness-based meditation was proposed as a way of enabling participants to see more clearly what is taking place in their experience and to choose their responses rather than responding habitually or automatically. Participants were encouraged to notice the wandering nature of their mind but to practice returning their attention gently but firmly to a present, single focus of the body and breath.

The final four sessions (5–8) focused on encouraging participants to use meditation practices to experiment with alternative ways of responding to emotional states, including but not limited to anxiety about health. The goal of the practices was for participants to develop greater awareness of their typical patterns of responding and to broaden their repertoire of mindful responses to emotional states. Participants were encouraged to acknowledge their distressed states with compassion and kindness and to be mindful of habitual and alternative ways of responding. As in the standard MBCT program for depression, the later sessions gave some attention to participants' broader lives. Participants were encouraged to take a reflective stance to their current lifestyle and be mindful of how they were spending their time and what impact this had on them. Nourishing (pleasant or fulfilling) and depleting (draining or stressful) activities were monitored, and participants were encouraged to reflect on the balance of activities in their life. In addition to the weekly sessions, participants were asked to engage in homework (meditation practices and related exercises) for approximately an hour per day for 6 days a week. In summary, the MBCT for health anxiety intervention retained the core values and principles of MBCT and utilized many of the exercises outlined by Segal et al. (2002b) for treating depressive relapse but was adapted in that the rationale and psycho-educational aspects focused on hypochondriasis. See McManus et al. (2012) and Surawy et al. (2013) for more details about the modification and implementation of MBCT with hypochondriasis.

MBCT classes were led by an experienced MBCT class facilitator (CS) with a co-facilitator/teacher. Monthly supervision was provided by one of the originators of MBCT (MW), who monitored both adherence to the MBCT protocol and competence in delivering it. In addition, all MBCT sessions were video-recorded, and 50.0 % were assessed by independent psychologists on the mindfulness-based cognitive therapy adherence scale (MBCT-AS; Segal et al. 2002a). The mean MBCT-AS score was 27.25 (SD=3.30) which is comparable to scores reported in the psychometric evaluation of the scale (Segal et al. 2002a) and in other trials of MBCT (Kuyken et al. 2008) and indicates good adherence to the MBCT protocol.

Measures

The Short Health Anxiety Inventory (SHAI: Salkovskis et al. 2002) is an 18-item self-report questionnaire measuring health anxiety which has been shown to be reliable, to have a high internal consistency, and to have good sensitivity/ specificity (Salkovskis et al. 2002).

The Southampton Mindfulness Questionnaire (SMQ: Chadwick et al. 2008) is a 16-item measure that assesses participants' self-perceived relationship with distressing

thoughts and images. Participants are provided with the prompt "usually when I experience distressing thoughts and images" and are then given 16 statements relating to ways in which they may respond to the mental events. They rate how much they agree with each statement on a scale from 0=*strongly disagree* to 6=*strongly agree*. The SMQ assesses four related bipolar constructs (with higher scores indicating higher levels of the italicized component): (1) *decentered awareness of mental events* vs. being lost in reacting, (2) *ability to allow attention to remain with difficult thoughts/images* vs. experiential avoidance, (3) *acceptance of difficult thoughts/images and oneself* vs. judging cognitions and self, and (4) *letting difficult thoughts/images pass without reacting* vs. rumination/worry. Chadwick et al. (2008) examine the reliability and validity of the SMQ in both clinical (psychosis) and non-clinical samples (meditators and non-meditators) and report the SMQ to be internally reliable (Cronbach's α=0.89) and to be significantly correlated with other measures of mindfulness (r=0.57), to show expected associations with affect, and to distinguish between meditators, non-meditators, and a clinical sample (psychosis). Similarly, Baer et al. (2006) report the SMQ to have good internal consistency (Cronbach's α=0.85) and to be significantly correlated with other measures of mindfulness (rs=0.38–0.55) in a non-clinical sample (N=613). As factor analysis has not supported the use of subscales within the SMQ (Baer et al. 2006; Chadwick et al. 2008), only total scores are analyzed.

For the purposes of the present study, the SMQ was adapted to assess participants' relationship solely with images, rather than their relationship to both thoughts and images. In addition, so that change could be assessed, the time frame was changed to refer to the past week only, rather than generally. These modifications were achieved by changing the original introductory statement from "usually when I experience distressing thoughts and images" to "over the last week when I have experienced distressing images" and the words "thought" or "thoughts" were removed from any response choices that included them (items 3, 7, 8, 9, 11, 13, 15, and 16) so that all items referred only to images as opposed to "thoughts or images."

The semistructured interview was based on those used in previous studies (e.g., Day et al. 2004; Hackmann et al. 2000; Speckens et al. 2007) and has been reported in a previous study examining the prevalence and characteristics of intrusive imagery in hypochondriasis (Muse et al. 2010). Imagery was defined as a multi-sensory experience which could include any of the five modalities (visual, sounds, bodily sensations, taste, and smell). Interviews were audio recorded and lasted between 30 and 60 min. They were carried out blind to treatment status, within the context of a larger research trial. Interviews were carried out by a trained assessor (KM), under the supervision of clinical psychologists who were experienced in working with imagery in anxiety disorders (FM and AH).

Participants were asked to focus on experiences of being anxious about their health which had occurred in the previous week in order to identify related intrusive imagery. Where participants reported multiple images, they were asked to identify their most significant/distressing image and all subsequent questions were asked in relation to this "index image" in order to maximize the accuracy with which they recalled information about the image. It is however important to note that, as images do not necessarily remain static over time (i.e., over time a specific image may spontaneously recover only to be replaced by a different distressing image), questions were asked with reference to the participants' most significant/distressing image *at that time* (i.e., during the week preceding each assessment time point). Hence, the interview focused on the image identified by the participant as their most distressing image (index image) at each assessment time point and thus was not necessarily the same image at each of the three assessment times (pre-intervention, post-intervention. and 3-month follow-up).

Four variables were measured within the interview: frequency, intrusiveness, associated distress, and level of engagement. First, participants estimated the frequency with which the image had occurred in the preceding week. Participants then rated how intrusive the image had been (i.e., "how much the image came to mind without you wanting it to or against your will") and how distressing the image had been in the preceding week on a scale from 0=*not at all* to 100=*extremely*. In line with the finding of Frewin et al. (2008) that taking part in a mindfulness-based intervention increased participants' perceived ability to disengage from or let go of negative automatic thoughts, a single item asking participants to rate how difficult it was to disengage from or let go of the index image over the last week was included (i.e., "how troublesome was this image for you, that is, how difficult was it to 'let go' [not get stuck on or keep thinking about] the image if it occurred?") on a scale from 0=*not at all difficult* to 4=*very difficult*. For all ratings, participants were shown the relevant visual analogue scale, which included written descriptions of the scale anchors, and asked to choose a number from that scale that best reflected their experience.

Data Analysis

The key hypotheses were (i) that there would be a reduction in the frequency, intrusiveness, and associated distress of images following MBCT and (ii) that participants' self-perceived relationship with images (as measured by the adapted SMQ and participants' perceived ability to disengage from or "let go" of images) would change following MBCT. Both of these hypotheses were tested by means of a repeated measures

MANOVA on all dependent variables (image frequency, intrusiveness, associated distress, level of engagement, and adapted SMQ scores), followed by a series of repeated measures ANOVAs for each dependent variable and post hoc analyses across the time points on each variable (dependent samples *t* tests). Effect sizes were calculated for pre-post and pre-follow-up based on an intention-to-treat sample and on the average standard deviation of the two means and corrected for dependence between means using Morris and DeShon's (2002) Eq. 8.

Results

All participants (N=20) completed the pre- and post-intervention assessments, but two (10 %) did not respond to invitations to complete the follow-up assessment. Intention-to-treat (Fergusson et al. 2002) analyses are reported throughout with post-treatment data carried forward for the two participants who did not attend the follow-up appointment. The analysis was also repeated without the carried forward data for the two participants who did not attend the follow-up and an identical pattern of results was found.

All participants were Caucasian and 13 (65 %) were female. Participants' mean age was 40.75 years (SD=11.58). Thirteen participants (65 %) were married, five (25 %) were single, and two (10 %) were separated or divorced. Participants had spent a mean of 17.9 (SD=5.09) years in education and 13 (65 %) were in full or part time employment, with three (15 %) on sick leave, two (10 %) unemployed, and two (10 %) retired. All participants met the DSM-IV-TR criteria for the diagnosis of hypochondriasis as their principal diagnosis, with the mean duration of the current episode being 9.33 (SD=10.38) years. As the sample was relatively homogenous, it was not possible to examine the relationship between most demographic and dependent outcome variables. However, Pearson's r correlations were used to examine the relationship between participant's age and years in education and pre-post changes in imagery variables (frequency, distress, and intrusiveness), participant's relationship with imagery (adapted SMQ and ability to disengage), and health anxiety. This analysis revealed no significant correlations between age or years in education and any of the dependent outcome variables (rs range from 0.01 to 0.39).

Participants' mean score on the SHAI was 34.35 (SD=6.03), which is in line with the reported scores of other patients diagnosed with hypochondriasis (e.g., Nakao et al. 2011; Salkovskis et al. 2002). Twelve participants (60 %) had one or more comorbid psychiatric diagnoses: four had one comorbid diagnosis; six had two comorbid diagnoses; and one had three comorbid diagnoses. Participants' comorbid diagnoses were as follows: depression (n=6), obsessive compulsive disorder (n=4), panic disorder (n=3), social phobia (n=3), specific phobia (n=2), alcohol abuse (n=1), and binge eating disorder (n=1).

Eight participants (40 %) attended all eight MBCT sessions, four participants (20 %) attended seven sessions, five participants (25 %) attended six sessions, one participant (5 %) attended five sessions, one participant (5 %) attended four sessions, and one participant (5 %) only attended two sessions. The mean number of sessions attended was 6.75 (SD=1.45).

Participants taking psychotropic medication were required to have been on a stable dose for at least 6 weeks prior to participating in the study. Nine participants (45 %) were taking psychotropic medication at intake to the study, and two (10 %) had ceased taking this medication by the follow-up assessment. No participants commenced taking psychotropic medication during the study. Two participants (10 %) had seen a psychological therapist in the 2 months prior to entering the study—both of these saw their therapist for further two sessions during the course of their participation in this study. No other participant commenced any other form of psychological or psychiatric intervention during the course of this study.

A repeated measures MANOVA on ratings of image frequency, image distress, image intrusiveness, perceived disengagement from index image, and adapted SMQ scores revealed a main effect of time (F(10, 10)=3.99, p=0.02, η^2=0.80). Repeated-measures ANOVAs revealed a significant effect of time on the frequency of the image, the distress associated with the image, the intrusiveness of the image, perceived disengagement with the image, and on adapted SMQ scores—see Table 1 for F values and effect sizes. Post hoc tests (dependent samples t tests) showed that post-treatment scores were significantly improved in comparison to pre-treatment scores on all variables (all ps<0.05) and that there were no significant changes between the post-MBCT assessment and the 3-month follow-up assessment (all ps>0.48). For imagery measures (frequency, distress, and intrusiveness), the pre–post-MBCT effect sizes were between d=0.75 and d=0.91 and pre-follow-up effect sizes were between d=0.70 and d=0.98. Effect sizes for the adapted SMQ, perceived disengagement rating, and SHAI were pre–post-MBCT of d=−1.04, d=1.13, and d=1.50, respectively, and pre-follow-up of d=−1.16, d=0.96, and d=1.58, respectively.

Table 1 shows mean ratings and standard deviations for all measures at pre-treatment, post-treatment, and follow-up, with effect sizes (intention to treat).

Discussion

Participants reported experiencing intrusive images significantly less frequently following the MBCT intervention, and

Table 1 Means, confidence intervals, results of ANOVAs and post hoc comparisons, and effect sizes for the frequency, distress, intrusiveness, and disengagement ratings, and Southampton Mindfulness Questionnaire Scores at pre-, post-, and 3 months following MBCT

Measure	Mean (SD)			$F(2, 38)$[a]	Effect size (Cohen's d)[b]	
	Pre-MBCT	Post-MBCT	Follow-up		Pre-post	Pre-follow-up
Index image frequency (per week)	7.70 (12.51)	0.68 (0.92)	0.88 (1.55)	6.47**	0.95	0.83
	[1.84, 13.56]	[0.24, 1.11]	[0.15, 1.60]			
Distress associated with index image (0–100)	73.50 (23.68)	49.00 (33.11)	48.75 (28.51)	10.21***	0.75	0.98
	[62.42, 84.58]	[33.50, 64.50]	[35.41, 62.09]			
Intrusiveness of index image (0–100)	31.98 (32.92)	6.50 (15.65)	11.00 (21.98)	8.73***	0.91	0.70
	[16.57, 47.38]	[−0.83, 13.83]	[0.71, 21.29]			
Disengagement from index image (0–4)	1.40 (1.18)	0.38 (0.63)	0.33 (0.57)	11.69***	1.13	0.96
	[0.85, 1.95]	[0.08, 0.67]	[0.06, 0.59]			
Adapted SMQ (0–108)	43.20 (18.57)	61.95 (15.60)	60.85 (17.94)	18.83***	−1.04	−1.16
	[34.51, 51.89]	[54.65, 69.25]	[52.45, 69.25]			
SHAI	34.35 (6.03)	25.35 (9.48)	25.55 (9.38)	29.06***	1.50	1.58
	[31.53–37.17]	[20.92–29.79]	[21.16–29.94]			

SMQ Southampton Mindfulness Questionnaire, *SHAI* Short Health Anxiety Inventory

**$p<0.01$, ***$p<0.001$

[a] For frequency and disengagement, Maulchy's test of sphericity indicated that the assumption of sphericity had been violated for the main effect of time (frequency: $\chi^2[2]=62.83$, $p<.001$, disengagement: $\chi^2[2]=7.46$, $p<.05$); therefore, degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity (frequency: [$\varepsilon=0.51$] to $F[1.02, 19.29]$, disengagement: [$\varepsilon=0.75$] to $F[1.49, 28.38]$)

[b] Effect size calculations are based on the average standard deviation of the two means and corrected for dependence between means using Morris and DeShon's (2002) Eq. 8

this reduction was maintained at 3-month follow-up. The mean frequency of experiencing intrusive images reduced from more than seven time per week to less than once a week. In addition, participants reported finding the images significantly less distressing and less intrusive when they did occur.

In addition to the impact on image characteristics (frequency, intrusiveness, and distress), results from this study indicate that participants' self-perceived relationship with intrusive imagery had changed. The SMQ was adapted to measure participants' perception of their relationship with images, and participants' adapted SMQ scores were significantly higher after participating in the MBCT program, with this increase being maintained at 3-month follow-up. Chadwick et al. (2008) report mean SMQ scores of 57.4 for a sample of "meditators," 48.5 for "non-meditators," and 37.2 for a clinical group (psychosis—data from more directly comparable clinical groups is not available). In the current study, participants' SMQ scores were between the clinical and non-meditator means at pre-intervention. However, at the post-intervention and follow-up assessments, participants' SMQ scores rise above the mean reported for meditators. This change reflects an increased ability to (1) show decentered awareness of mental events, (2) allow attention to remain with difficult images, (3) accept difficult images and oneself, and (4) let difficult images pass without reacting. Furthermore, there was a significant increase in the single item measuring participants' self-perceived ability to disengage from or let go of distressing images following MBCT, which was also maintained at follow-up. These findings are consistent with Chadwick et al. (2009) report of an improved ability to respond mindfully to distressing thoughts and images following a mindfulness-based intervention and the findings of Frewin et al. (2008) that a mindfulness-based intervention led to decreased frequency of negative thoughts and increased ability to let go of negative automatic thoughts.

Developing a more "mindful" relationship with imagery may be beneficial for a number of reasons. First, enabling participants to let distressing images pass without reacting may enable those with hypochondriasis to break habitual responses, such as avoidance and reassurance-seeking, which maintain both anxiety and intrusive imagery (Salkovskis and Campbell 1994; Speckens et al. 2007; Steil and Ehlers 2000; Ehlers and Steil 1995). Reduced experiential avoidance of distressing imagery may also facilitate exposure to and emotional processing of distressing "hot spots," thereby updating associated traumatic memories and facilitating emotional processing of associated cognitive distortions (Grey et al. 2002). Second, MBCT encourages participants to adopt a more compassionate stance, which may help individuals to give less authority to self-judgment and blame (Kuyken et al. 2010) and thus to give less authority to the negative self-evaluative beliefs (e.g., "I am a failure" or "I am a nuisance") that Wells and Hackmann (1993) report to be typically associated with intrusive imagery in patients with hypochondriasis.

Third, due to the overlap between the cognitive resources involved in imaginal and perceptual processing, and the fact that imagery activates many of the same brain systems involved in perception, it has been proposed that imagery is particularly distressing in part because individuals respond to images as if they were real stimuli (Holmes and Mathews 2010). If patients with hypochondriasis respond to images of death and illness as if they were real, impending events, then recognizing such images as products of the mind, rather than valid reflections of reality, should reduce the threatening nature of the images and thus the associated distress.

With regard to the clinical implications arising from the study, MBCT is an indirect intervention and thus does not attempt to change the content of mental events (i.e., thoughts or images) but instead attempts to change the individual's relationship with their mental events. However, the pre–post-MBCT effect sizes reported here for image frequency (d=0.95), distress (d=0.75), and intrusiveness (d=0.91) compare favorably with those reported for direct imagery interventions. For example, Brewin et al. (2009) report an effect size of d=1.55 on a composite intrusive memory score for an imagery re-scripting treatment for depressed patients with intrusive memories, with a mean duration of 8.1 individual sessions. Similarly, Wild et al. (2008) report the impact of a single session imagery re-scripting intervention to give rise to changes corresponding to effect sizes of d=0.12 for image frequency and d=1.06 for image distress. Comparison of the effect sizes suggests that MBCT may provide an equally effective alternative method for addressing distressing intrusive imagery. In addition, because it is a class-based intervention, MBCT may provide a comparatively cost-efficient means of ameliorating distressing intrusive imagery. A further potential advantage of MBCT is that, rather than targeting specific images that are currently a focus at the time of treatment, MBCT provides patients with a strategy that can be applied to any images occurring in the present or future. In this way, MBCT may provide a useful relapse prevention strategy, which is especially important given the chronic, recurrent nature of hypochondriasis (olde Hartman et al. 2009).

Furthermore, indirect interventions such as MBCT may circumvent some of the inherent difficulties faced by direct imagery interventions that target the content or meaning of health anxious images. Consistent with the inflated perception of the probability and cost of illness observed in hypochondriasis (Barsky et al. 2001a; Haenen et al. 2000), images focus on themes of future illness and death (Muse et al. 2010). The prospective nature of these images, and the fact that they are to some degree realistic (in that we will all die and most of us will become seriously ill before doing so), presents challenges for direct imagery intervention techniques that seek disconfirmation of the beliefs underlying the meaning/content of the image because these beliefs are not easily amenable to disconfirmation. MBCT circumvents these difficulties as it does not directly target image meanings but attempts to change the individual's relationship with images.

While this study provides a novel insight into the impact of MBCT on intrusive imagery in hypochondriasis, the results must be interpreted cautiously in the context of the study's limitations. First, it must be noted that the imagery interview has had no psychometric evaluation and the SMQ was adapted meaning that its psychometric properties cannot be guaranteed. Second, in line with some other studies of patients with hypochondriasis, the sample in the current study was predominately female, Caucasian, and highly educated (e.g., 74.5–78.8 % female and 70.6–74.1 % Caucasian; 76.4 % female and 72.0 % Caucasian in Nakao et al. 2011). The sample appears comparable to other samples of patients diagnosed with hypochondriasis in terms of having comparable scores on standardized measures of health anxiety, a mean duration of the current episode of over 9 years, and high rates of comorbidity. However, it cannot be known how the results generalize to more diverse samples of patients with hypochondriasis, and further research on larger more diverse samples is needed to establish this. Similarly, due to the absence of a control group, it is not known to what degree the changes demonstrated in this study were a result of components specific to participating in the MBCT intervention, or to nonspecific therapeutic factors, or simply the passage of time. Furthermore, as the results of the study do not provide causal evidence, it cannot be established whether the frequency and intrusiveness of the image or the associated distress reduced as a result of participants' new perspective on imagery or vice versa. Future research could usefully address these issues by using controlled designs with mediational analyses. A priority for further research will be to examine the impact of MBCT on intrusive imagery in other disorders in order to establish whether the findings of this study generalize to other disorders and thus whether MBCT has the same impact on participants' relationship with imagery across disorders.

In summary, after participating in the MBCT intervention, participants experienced intrusive images less frequently, and the images were perceived to be less intrusive and less distressing when they did occur. Furthermore, participants' adapted SMQ scores were significantly increased following the MBCT intervention, suggesting that participants' relationship with their intrusive images had changed in that they had developed a more "mindful" and compassionate response to the images when they did occur. Given that prior research has identified the prevalent and distressing nature of intrusive imagery in hypochondriasis (Muse et al. 2010), interventions that may attenuate it are worthy of further investigation in larger samples and across the anxiety disorders.

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