Mindfulness-Based Stress Reduction:
Sustained benefits and the role of continued practice

Tessa A. Eidelman
Department of Psychology
University of Cape Town

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Stand still.
The trees before you and the bushes beside you are not lost.
Wherever you are is a place called Here,
And you must treat it as a powerful stranger,
Must ask permission to know it and be known.
The forest breathes. Listen. It answers,
I have made this place around you,
If you leave it you may come back again saying Here.
No two trees are the same to Raven.
No two branches the same to Wren.
If what a tree or a bush does is lost on you,
You are surely lost. Stand still. The forest knows
Where you are. You must let it find you.
David Wagoner

Abstract

Past participants in an eight-week mindfulness-based stress reduction (MBSR) programme completed a follow-up survey that aimed to explore the effects of the programme and the role of continued mindfulness practice on mindfulness skill and perceptions of stress. A quasi-experimental study was conducted using a one-group pre-test post-test design with follow-up (n = 60). People who participated in the MBSR programme between 2007 and 2012 through the private practices of two local health professionals and who previously consented to be involved in research were invited to participate in this study. These MBSR participants completed measures of mindfulness and perceived stress before and directly after their involvement in the MBSR programme. In this study, participants were invited to complete these same measures for a third time via an Internet survey. The survey also included a developed instrument to capture participants' continued formal and informal mindfulness practice. MBSR participants showed statistically significant increases in mindfulness and decreases in perceived stress following the programme and these outcomes were sustained at follow-up. Continued formal and informal practice significantly predicted greater levels of mindfulness but not changes in perceived stress. However, greater mindfulness was associated with decreases in perceived stress. MBSR is a relatively short programme that is associated with positive and enduring changes in mindfulness and perceptions of stress both in the short and long-term. Continued mindfulness practice plays a role in sustaining mindfulness skills after completing the programme but its effects on perceptions of stress are less clear. The role of continued practice and other possible variables that may contribute to sustaining the benefits of the MBSR programme are discussed in light of these findings. Continued mindfulness practice and its benefits is an area that warrants further exploration in future MBSR research.

Keywords: mindfulness-based stress reduction; mindfulness; meditation practice; perceived stress; MBSR follow-up

Introduction

The mindfulness-based stress reduction (MBSR) programme has been shown to improve mental health and assist both clinical and non-clinical populations with the challenges they face (Fjorback, Arendt, Ornbol, Fink, & Walach, 2011; Grossman, Niemann, Schmidt, & Walach, 2004). MBSR is an eight week structured group meditation programme that focuses on cultivating mindfulness through intensive training in formal and informal mindfulness techniques (Kabat-Zinn, 1990). The programme, developed in 1979 by Jon Kabat-Zinn, brought Buddhist meditation practices into the clinical setting in a secular, non-ideological manner (Kabat-Zinn, 1990). The MBSR programme was intended to offer medical patients a "training vehicle for the relief of suffering" while also developing a model for a replicable clinical intervention (Kabat-Zinn, 2003, p. 148).

During the MBSR programme participants learn and practice formal mindfulness techniques (e.g. sitting meditation, body scan, mindful hatha yoga) and more informal techniques (e.g. mindful eating). Participants are required to practice these techniques at home between weekly sessions for up to 45 minutes, six days a week. The programme consists of eight weekly sessions of two and a half hours each plus one full day session (eight hours). Each participant is given a set of CDs which support home practice of the formal techniques learned during the programme (Kabat-Zinn, 1990).

Mindfulness and its benefits

In the Buddhist tradition, mindfulness is an essential quality of consciousness that is cultivated or developed during meditation (Rinpoche, 2002). The practice of mindfulness has been described as "keeping one's consciousness alive to the present reality" (Hanh, 1991, p. 11) and is a practice of intentionally bringing awareness to whatever is happening in the present moment. As they arise, experiences such as thoughts, emotions, physical sensations or sensory experiences can all be intentionally attended to during mindfulness practice. An important aspect of mindfulness, however, is the attitude with which or *how* these experiences are observed. The descriptions of mindfulness practice as 'Peacefully Remaining' or 'Calm Abiding' point to the intended attitude, which is one of equanimity, non-reactivity and self-acceptance (Nairn, 1998; Rinpoche, 2002). The practice of mindfulness is an inquiry that entails observing current experiences with dispassionate curiosity and openness and without judgement of experiences as good, bad, right or wrong (Bishop et al., 2004; Kabat-Zinn, 1990). This requires a receptive attitude to one's present reality: a willingness to allow and be with what is present regardless of whether it is

pleasurable or painful, wanted or unwanted. In this way a more objective stance is taken toward thoughts, feelings and sensations and the practitioner learns to "dis-identify" from these experiences instead of being "defined (i.e. controlled, conditioned, determined) by them" (Shapiro, Carlson, Astin, & Freedman, 2005, p. 378). Thus all experiences, whether joyful or painful, are non-judgementally acknowledged as are one's tendencies to want to avoid, deny, suppress or fixate on them(Nairn, 1998; Vago & Silbersweig, 2012). Mindfulness is not a practice of cold detachment but rather is a practice in which one's experiences, habitual reactions to experiences and the nature of the mind can be clarified and intimately known (Nairn, 1998; Shapiro et al., 2005). When we are able to observe the mind's activity mindfully, this is said to reduce suffering, lead to tranquillity and the development of profound insight into oneself (Nairn, 1998).

Increased mindfulness is believed to result from the practice of mindfulness during formal practices such as meditation and is said to be the active ingredient of the MBSR programme(Dobkin & Zhao, 2011). It is theorised that being more mindful makes one more likely to observe external and internal experiences in an accepting way which in turn enables the practitioner to improve their self-regulation and to use more adaptive coping strategies (Brown & Ryan, 2003; Fjorback et al., 2011; Hölzel et al., 2011). As mindfulness increases, habitual avoidance of unpleasant experiences, rumination and/or reactivity are believed to be reduced and more adaptive, measured responses are increased (Bishop et al., 2004; Grossman, Tiefenthaler-Gilmer, Raysz, & Kesper, 2007; Kabat-Zinn, 2003).

Scientific evidence supports the benefits of mindfulness practice. Research suggests that continued practice of formal mindfulness meditation in healthy individuals is significantly correlated with increased mindfulness. In turn, higher mindfulness levels are associated with decreased perceived stress, rumination, catastrophising, trait anxiety, fear of emotion and increased self-compassion and behavioural self-regulation (Chiesa & Serretti, 2009; Lykins & Baer, 2009). In clinical populations, higher levels of mindfulness are correlated with decreased perceived stress and medical symptoms, improved mood and quality of life (Brown & Ryan, 2003; Carmody & Baer, 2008; Dobkin & Zhao, 2011; Nyklíček & Kuijpers, 2008). This suggests that developing higher levels of mindfulness does have a positive impact on both mental and physical health.

MBSR and mindfulness

The MBSR programme has been shown to increase levels of mindfulness (Dobkin & Zhao, 2011; Nyklíček & Kuijpers, 2008; Vøllestad, Sivertsen, & Nielsen, 2011). This may

explain its numerous beneficial effects on the physical and mental health of a wide variety of populations including healthy people(Chiesa & Serretti, 2009), heterogeneous groups of patients(Majumdar, Grossman, Dietz-Waschkowski, Kersig, & Walach, 2002; Reibel, Greeson, Brainard, & Rosenzweig, 2001) people with chronic pain conditions (Grossman et al., 2007; Rosenzweig et al., 2010), diabetes (Hartmann et al., 2012), HIV(Creswell, Myers, Cole, & Irwin, 2009; SeyedAlinaghi et al., 2012), asthma (Pbert et al., 2012), traumatic brain injury (Bedard et al., 2005), cancer(Brown & Ryan, 2003; Carlson, Ursuliak, Goodey, Angen, & Speca, 2001; Lengacher et al., 2007) depression and anxiety disorders(Arch et al., 2013; Hofmann, Sawyer, Witt, & Oh, 2010; Miller, Fletcher, & Kabat-Zinn, 1995; Vøllestad et al., 2011).

The health benefits of the MSBR programme include reductions in depressive symptoms (Bedard et al., 2005; Fjorback et al., 2011; Hartmann et al., 2012; Hofmann et al., 2010), anxiety symptoms (Arch et al., 2013; Hofmann et al., 2010; Miller et al., 1995; Vøllestad et al., 2011) and psychological distress (Carlson et al., 2001; Grossman et al., 2007; Majumdar et al., 2002; Reibel et al., 2001; Rosenzweig et al., 2010). Studies have also demonstrated reductions in perceived stress following participation in the MBSR programme (Carlson et al., 2001; Fjorback et al., 2011; Hartmann et al., 2012; Pbert et al., 2012). Positive changes on various quality of life scales are also frequently reported (Grossman et al., 2007; Pbert et al., 2012; Reibel et al., 2001; Rosenzweig et al., 2010). In a number of medical conditions (e.g. HIV and fibromyalgia), the MBSR programme is effective in reducing physical symptoms and improving health status (Creswell et al., 2009; Grossman et al., 2007; Reibel et al., 2001; SeyedAlinaghi et al., 2012). In some cases the programme does not lead to improvements in the physical condition (e.g. asthma), but appears to enhance patients' ability to cope with their symptoms and distress thereby improving quality of life (Pbert et al., 2012). This lends some credence to the theory that the MBSR programme alters how people perceive their experiences and in turn how they cope with them (Shapiro et al., 2005).

While many studies have investigated the immediate benefits of the MBSR programme(e.g. Creswell et al., 2009; Nyklíček & Kuijpers, 2008) fewer have examined its long-term benefits. The lack of long-term follow-up has been highlighted as a limitation in many studies of the programme(Chiesa & Serretti, 2009; Fjorback et al., 2011; Grossman et al., 2004). Follow-up data from high quality studies are beginning to emerge with promising results (e.g. Arch et al., 2013; Pbert et al., 2012).

Literature including follow-up data reveals that many of the benefits of the MBSR programme (described above) are reported to be sustained at 3 months (e.g. Majumdar et al.,

2002), 6 months (e.g. Carlson et al., 2001; Vøllestad et al., 2011), 12 months (e.g. Pbert et al., 2012; Reibel et al., 2001; SeyedAlinaghi et al., 2012) and even 3 years (e.g. Grossman et al., 2007; Miller et al., 1995). Thus the skills learnt during the MBSR programme may have a long lasting impact on the lives of people living with chronic and stress related illnesses. It remains unclear, however, what factors contribute to the long-term maintenance of the benefits of the programme.

Mindfulness practice

Practice of the skills learned during the MBSR programme is believed to be an important aspect of the intervention that facilitates change (Vettese, Toneatto, Stea, Nguyen, & Wang, 2009). It is assumed that mindfulness (the active ingredient of MBSR) is primarily cultivated through practice. Home practice, however, is rarely targeted as a primary focus of MBSR research (Dobkin, 2008; Vettese et al., 2009). A review of the MBSR literature including reports on home practice *during* the programme revealed mixed results: some studies show significant correlations between greater practice and positive outcomes while others do not (Vettese et al., 2009). Fjorback et al. (2011) reported similar discrepancies in a recent systematic review. There are also mixed results regarding which type of practice (formal or informal) better predicts MBSR outcomes (Dobkin & Zhao, 2011).

These disparate findings may be the result of the use of different measures and definitions of 'practice' or as Dobkin and Zhao (2011) point out, perhaps participants need more time (more than the eight weeks of the MBSR programme) to develop a consistent self-practice. Indeed, researchers that have demonstrated the sustained benefits of MBSR have also reported high rates of continued practice *after* the programme (e.g. Grossman et al., 2007; Miller et al., 1995; Vøllestad et al., 2011). Thus it is plausible that continued mindfulness practice plays a role in sustaining the benefits of the programme over time.

There is a paucity of long-term follow-up studies that also reliably report on continued practice. Such investigations suffer from the same problems as home practice investigations in that they are often cursory and rarely delineate the form that continued practice takes. Thus more systematic ways of capturing these data are needed to better understand the relationship between continued mindfulness practice and the long-term outcomes of the MBSR programme. Is continued practice important to sustain the benefits of MBSR? And if so, what type of practice (formal or informal) best predicts sustained or continued improvement after the programme? These are the questions this investigation aimed to address.

Research aims and hypotheses

The first aim of the study was to explore whether participation in an eight-week MBSR programme is associated with increased mindfulness and decreased perceived stress and whether this is sustained over time. The second aim was to explore the relationship between continued practice, mindfulness and perceived stress. The following hypotheses were tested:

1. Participation in an eight-week MBSR programme is associated with significant increases in levels of mindfulness skill following the programme and these increases are sustained at follow-up.
2. Participation in an eight-week MBSR programme is associated with significant decreases in perceived stress following the programme and these decreases are sustained at follow-up.
3. Greater continued practice of formal and informal mindfulness techniques predicts greater mindfulness.
4. Greater continued practice of formal and informal mindfulness techniques predicts decreased perceived stress.

Method

Research design and setting

The MBSR programme has been offered in Cape Town, South Africa since 1999 through the private practices of Dr. Simon Whitesman (MB ChB) and Ms. Linda Kantor MA (counselling psychologist) who both trained in MBSR at the University of Massachusetts medical school where the programme was developed. Since 1999 all participants in the MBSR programme have been invited to voluntarily complete a questionnaire pack containing measures of mindfulness, perceived stress, mood states and medical symptoms at the start and directly after the programme for research purposes. These data have been captured but not yet analysed. One study has been planned by the Medical Research Council (MRC) and is currently under way to compare all baseline and post-intervention data from 1999 to 2012 (please see Appendix A for ethics approval for this study).

Considering that baseline and post-intervention data had already been collected for several years meant that an opportunity existed to design a study using this existing data to answer questions currently of interest in the field of MBSR. As outlined in the introduction, there is currently a need for more follow-up research and questions have arisen regarding the mechanisms by which the MBSR programme exerts its effects. It was with these questions in mind that this current study was developed. Are the benefits of MBSR sustained over time and does continued practice play a role in sustaining these benefits? To attempt to answer these questions, the existing data, collected in a 'real-world' setting, were used along with additional follow-up data that were collected by the researcher of this study.

A collaboration with the MRC was established in which access to the existing data was negotiated. The researcher chose to focus on the period 2007 to 2012 because the same measures of mindfulness and perceived stress were administered throughout these years.

The first aim (hypotheses 1 and 2) of this study was to establish if the MBSR programme is associated with increases in mindfulness and decreases perceived stress and if so, if these benefits are sustained over time. A quantitative, quasi-experimental repeated measures design was used. More specifically, a one group pre-test post-test design with follow-up was used. Using an Internet survey, the same measures of mindfulness and perceived stress were administered to past MBSR participants who completed these measures at the time of the programme. Thus data at three time points were available for analysis i.e. baseline, post-intervention and follow-up.

The second broad aim of the study was to explore the relationship between the variables continued practice, mindfulness and perceived stress (hypotheses 3 and 4). This was

tested using a quantitative, correlational design. The researcher was interested in the role of continued mindfulness practice in sustaining the benefits of the MBSR programme. As part of the Internet survey, participants completed a measure of continued formal and informal mindfulness practice, which was developed by the researcher (discussed further below).

Participants

Participants in the MBSR programme. Participation in the MBSR programme is voluntary with most participants being referred to the programme by a doctor, psychologist or other mental health professional. All participants are screened by the programme facilitators prior to acceptance into the programme. The participants in the local MBSR programme represent a heterogeneous clinical population including people with diagnoses such as chronic pain disorders, depression, anxiety disorders, stress-related disorders and chronic illnesses. Some participants choose to complete the programme to enhance their mental health and well-being and to better manage everyday stressors. People who lack motivation to complete the programme or who have an active psychosis, substance addiction, suicidal ideation, borderline personality disorder or are otherwise considered acutely ill or particularly vulnerable are excluded from participation in the programme.

A total of 469 people completed MBSR between 2007 and 2012 of which 310 completed questionnaire packs and consented to have these used in future research. These 310 participants were targeted for follow-up in this current study.

Participants in the current study. Of the 310 participants targeted, a total of 60 participants engaged in the current study. A summary of demographic information of the participants in this study ($n = 60$) can be found in Table 1. Participants were 16 men and 44 women who ranged in age from 24 to 72 years old ($M = 45$, $SD = 10.6$). All but one participant had some university education and more than half of the participants had postgraduate education. The number of months since completing the MBSR programme ranged from 9 months to almost 6.5 years with a mean of 33 months (2 years, 9 months) since completion.

Table 1
Demographic characteristics of participants in the current study (n = 60)

	Minimum	Maximum	Mean (SD)
Time Since MBSR (months)	9	77	33 (16.9)
Age	24	72	45 (10.6)

	Number	%
Sex		
Male	16	26.7
Female	44	73.3
Education		
High school	1	1.7
Some tertiary education	4	6.7
Undergraduate qualification	12	20
Some postgraduate study	3	5
Postgraduate qualification	40	66.7

Procedure

As discussed above, consenting MBSR participants completed questionnaire packs which included measures of mindfulness and perceived stress at the time of their engagement in the programme: once prior to starting the programme (baseline) and again directly after programme completion (post-intervention). Using an Internet survey, the current study re-administered these same measures of mindfulness and perceived stress to past MBSR participants and collected data regarding their continued practice of formal and informal mindfulness techniques since completing the programme.

All MBSR participants' contact details exist on a database to receive electronic news and updates from the facilitators of MBSR and the Institute for Mindfulness South Africa (IMISA). An email invitation to complete a follow-up survey (Appendix B) was sent to participants using this database. For reasons of confidentiality the researcher did not have access to this database and the secretary of the MBSR programme sent the invitations on the researcher's behalf. Only participants who completed MBSR between 2007 and 2012 and who also consented to being involved in research were contacted (n = 310). Of these, 289 people were successfully contacted via email and were invited to participate in this study (21 email addresses no longer worked). Two follow-up e-mails were sent over a period of four weeks as reminders to complete the survey (Appendix C).

An Internet survey is efficient, cost-effective and can reach a large number of people in a short period of time. It also allows participants to respond at a time that is convenient for them (Wilson & MacLean, 2011). Participants who no longer reside in Cape Town were also made contactable using this method. The fact that the majority of the participants in the local

MBSR programme are of higher socioeconomic status led to the assumption that most participants have Internet access. It was thus unlikely that using an Internet survey would exclude a large number of people and bias the sample. The nature of the information being sought was not highly personal or sensitive or likely to distress participants, which also made the use of the Internet acceptable.

The survey was created using a web-based survey programme called 'Survey Monkey'. Participants had a period of four weeks in which to complete the survey. The survey was constructed and disseminated drawing on the principles of Dillman's (2007) Tailored Design Method based on theories of social exchange. This method includes ideas on how to enhance response rates based on research in this area. Suggestions are made regarding rewarding participants, reducing social costs and fostering trust (Dillman, 2007). Examples of reward in this study included giving all potential participants a token of appreciation in advance (a discount voucher for a yoga class) (included in Appendix B) and those who completed the survey received an additional discount voucher for mindfulness CD's from be-awake.co.za (Appendix D). Costs of participating in the research were reduced by making it convenient to respond to the survey (by using an Internet-based survey) and by being cognisant of the length of the survey. Trust was fostered by showing respect, positive regard, and gratitude for participants in all communications with them.

Details of the actual MBSR programme were discussed in the introduction and are described in detail elsewhere (see Kabat-Zinn, 1990).

Measures

A copy of the survey including the below mentioned measurement instruments can be found in Appendix E. Although the content of the Internet survey was exactly the same, the formatting was altered to ensure that it was user-friendly and easy to navigate (Dillman, 2007). The Internet survey also did not include the names of the measures being used in order to reduce any bias that might be created by the participants' knowledge of what was being measured.

Demographic information. Basic demographic information was collected in the survey and included age, sex and level of education.

Perceived Stress. Perceived stress was measured using the Perceived Stress Scale (PSS-10) (Cohen & Williamson, 1988). The PSS-10 was also used to measure perceived stress before and directly after participation in the MBSR programme. This was an important consideration in selecting this measure for this research as it meant the same measure could

be repeated for a third time. The PSS-10 measures the extent to which life situations are regarded as stressful i.e. unpredictable, uncontrollable and overwhelming. The PSS-10 is a 10-item self-report instrument in which respondents have to indicate how often they have felt or thought a particular way over the past month using a Likert-type scale. Scores range from 0 to 40 with a higher score indicating higher perceived stress. The scale is widely used (e.g. Dobkin & Zhao, 2011; Nyklíček & Kuijpers, 2008; e.g.Pbert et al., 2012) including in South Africa (e.g. Hamad, Fernald, Karlan, & Zinman, 2008; Pau et al., 2007). The PSS-10 is reported to have good test-retest reliability ($r > .70$) (Lee, 2012) and internal consistency (Cronbach's $\alpha = .72$ to .89) (Cohen & Williamson, 1988; Hamad et al., 2008; Roberti, Harrington, & Storch, 2006). The use of a scale that captures perceived stress was appropriate in this context as the MBSR programme and continued practice of mindfulness are believed to beneficially alter how people perceive and appraise difficult life situations and/or symptoms (Shapiro et al., 2005).

Mindfulness. Level of mindfulness was measured using the Kentucky Inventory of Mindfulness Skill (KIMS) (Baer, Smith, & Allen, 2004). The KIMS is a 39-item multifaceted measure of mindfulness that focuses on four components of mindfulness: observing, describing, acting with awareness, and accepting/allowing without judgement. The KIMS is designed to measure mindfulness in everyday life and is among a number of recently developed and accepted measures of mindfulness (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). It is reported that the KIMS has adequate to good internal consistency (Cronbach's $\alpha = .83$ to .91) and adequate to good test-retest reliability ($r = .61$ to .86) (Baer et al., 2004). The KIMS was chosen to use in this study as it was also used to measure mindfulness before and directly after participation in the MBSR programme. The use of this scale was appropriate as it can capture changes in levels of mindfulness and to what extent mindfulness practice has been incorporated into daily life, which is an important goal of the MBSR programme.

Continued practice. After an extensive literature review, no validated measure was found for capturing continued practice of the techniques taught during the MBSR programme. For this reason a scale was developed (included in Appendix E). Participants were asked to report on their formal and informal mindfulness practice. 'Formal practice' incorporates skills learned during MBSR: sitting meditation, walking meditation, body scan and mindful hatha yoga. These practices are standard techniques taught during the MBSR programme (Kabat-Zinn, 1990). In each case, participants indicated the frequency (number of days per week) and duration (number of minutes per practice) of practice for each skill in a

typical week. Participants were also asked about the frequency and duration of engagement in any other form of mindfulness practice such as Tai Chi or Qi Gong. 'Informal practice' was operationalised as the frequency with which mindful attention is purposefully placed on (a) breathing, (b) thoughts/feelings, (c) sensations/movement, and (d) the doing of ordinary daily activities (e.g. eating or doing chores) in a typical week. Participants rated their frequency of engagement in these activities on a seven-point Likert-type scale. These four items were chosen based on the informal mindfulness practices given as homework during the MBSR programme and in consultation with the facilitators of the programme.

This instrument yielded the following scores: amount of formal practice (including the number of practices in a typical week (frequency) and minutes spent practicing in a typical week (duration)), amount of informal practice (scaled from 4 to 28) and amount of other practice (frequency and duration in a typical week).

Ethical considerations

The study was granted ethics approval on 3 June 2013 (Ref: PSY2013-015).

Informed consent. Informed consent was obtained before participants began the survey by means of agreeing to an informed consent form included as part of the survey (see Appendix F). This form gave participants sufficient information to understand their involvement in the study and gave them the option to withdraw from the study at any time by closing their browser (O'Leary, 2010). Informed consent included participant's agreement to identify themselves by name for the purposes of linking their follow-up responses to their previous responses to the measurement instruments listed above.

Risk and harm. The survey presented little to no risk of harm to participants. The content of the survey did not represent highly personal or sensitive information that could cause undue distress. Participants were invited to contact the researcher by email or phone if they had any concerns about the research. No deception was used and sufficient information about the aims of the study was provided although the specific variables under investigation were not articulated. This was to decrease the possibility that only those who continue to practice responded.

Confidentiality. In order to link the follow-up data collected in this study with participants' previous baseline and post-intervention responses, it was necessary for participants to identify themselves by name. Baseline and post-intervention questionnaires are kept by the facilitators of the MBSR programme in their private practice archives. A list of responders to the current study was given to the secretary of the MBSR programme who

provided the researcher with these participant's questionnaires. This ensured that the facilitators of the MBSR programme remained unaware of who responded to the survey. Data were captured electronically without using the participant's names thus ensuring no identifiable link between the person and their responses. No names are used in the reporting of the results. Once data capturing was completed, the Internet survey data were removed from Survey Monkey. The abovementioned steps ensured that the researcher upheld confidentiality by protecting the identity of the research participants (Goodwin, 2010)

Results

Raw scores of the various measures were captured on Microsoft Excel and imported and analysed using IBM SPSS Statistics Software Version 21. Descriptive statistics and diagnostic tests were conducted initially on the data to ensure that the data met the assumptions of the intended statistical tests.

Hypotheses 1 and 2 concerned the changes in perceived stress and mindfulness following the MBSR programme. To compare each participant's baseline, post-intervention and follow-up scores on the PSS-10 and KIMS, two one-way repeated measures analysis of variance (ANOVA) were conducted (one for each scale). This test is appropriate to investigate within-subject differences when there are more than two scores to compare (Field, 2009).

The baseline and post-intervention measures of mindfulness (KIMS) and perceived stress (PSS-10) contained a small number of values missing at random. Two cases contained a total of five missing values on the baseline KIMS and four different cases contained a total of eight missing values on the post-interventions KIMS. One case was missing three values on the baseline PSS-10 and one different case was missing one value on the post-intervention PSS-10. Since the number of missing values was very small (< 5%) and instead of excluding these cases entirely, these missing values were imputed using linear interpolation. Linear interpolation uses existing values in a known range to predict and substitute a value in the same range(Wood & Park, 2004).

Two cases were missing close to half of the values on the baseline KIMS (participants appeared to have accidentally skipped a page of the questionnaire) and three cases were missing all post-intervention scores on both the KIMS and PSS-10 i.e. these participants did not complete the post-intervention questionnaire packs at all. Due to the large number of missing values, these cases were excluded from the ANOVA, which was thus conducted on 55 cases for the KIMS and 57 cases for the PSS-10.

Mindfulness (hypothesis 1)

Table 2 shows the mean mindfulness scores as measured by the KIMS at the three time points i.e. baseline, post-intervention, and follow-up. The ANOVA was statistically significant $F(1.64,88.78) = 67.02$, $p < .001$, $\eta_p^2 = .55$ indicating a statistically significant increase in mean mindfulness scores over the three time points. The size of the effect was moderate to strong. Mauchley's test showed that the assumption of sphericity was violated, $\chi^2(2) = 15.10$, $p < .05$, therefore the Huynh-Feldt correction is reported for within-subjects

tests. Bonferroni's post-hoc test indicated that participants in the MBSR programme showed a statistically significant increase in mindfulness from baseline to post-intervention, $p < .001$ and from baseline to follow-up, $p < .001$. The slight increase in mean mindfulness levels from post-intervention to follow-up was not statistically significant, $p = .50$. Hypothesis 1 was thus confirmed: Participation in an eight-week MBSR programme is associated with significantly higher levels of mindfulness following the programme, which are sustained at follow-up.

Table 2
Mean mindfulness and perceived scores at baseline, post-intervention and follow-up

	Baseline mean (SD)	**Post-intervention mean (SD)**	**Follow-up mean (SD)**
KIMS *	117.98 (19.23)	136.4 (16.25)	138.42 (14.91)
PSS-10 **	21.14 (6.71)	15.07 (6.01)	16.49 (6.11)

*n = 55, **n = 57
KIMS = Kentucky Inventory of Mindfulness Skill
PSS-10 = Perceived Stress Scale 10

Perceived Stress (hypothesis 2)

Table 2 also shows the mean perceived stress scores as measured by the PSS-10 at the same three time points. This ANOVA was also statistically significant $F(2,112) = 24.72$, $p < .001$, $\eta_p^2 = .31$ indicating a statistically significant decrease in mean perceived stress scores over time. The size of the effect was small to moderate. Bonferroni's post-hoc test indicated that participants in the MBSR programme showed a statistically significant decrease in perceived stress from baseline to post-intervention, $p < .001$ and from baseline to follow-up, $p < .001$. The slight increase in mean levels of perceived stress from post-intervention to follow-up were not statistically significant, $p = .35$. Hypothesis 2 was thus also confirmed: Participation in an eight-week MBSR programme is associated with significantly lower levels of perceived stress following the programme, which are sustained at follow-up.

Continued practice

Of the 60 participants followed up, 36 (60%) reported continued practice of at least one of the formal techniques learned during the MBSR programme in the past month and 24

(40%) reported no continued formal practice in the past month. Some participants (38%) also reported some other form of mindfulness practice such as participation in other types of yoga, meditation or the use of meditation or guided relaxation CD's. All participants continued to practice the skills learned during MBSR in an informal way. Scores on the devised informal practice scale ranged from 7 to 28 (M = 18.55, SD = 6.03).

Those who reported that they continue to practice formal mindfulness techniques averaged 4.7 (SD = 3.61) practices per week for an average duration of 63 minutes per practice (SD = 45,54). There was, however, great variation in the time spent practicing (between 10 and 180 minutes per week). Table 3 shows that those who indicated 'yes' to continuing any kind of formal practice had slightly higher mean scores of mindfulness and lower mean scores of perceived stress at follow-up than those who indicated no continued formal practice but these differences were not statistically significant. Table 3 also shows that those who continued to practice formally showed significantly higher levels of informal practice than those who did not ($p < .05$).

Table 3
Mean mindfulness, perceived stress, and informal practice scores by continued formal practice (yes/no)

	Continued formal practice		
	Yes (n = 36)	**No (n = 24)**	***t***
KIMS at follow-up			
Mean (*SD*)	138.33 (15.8)	135 (16.06)	-0.8
PSS-10 at follow-up			
Mean (*SD*)	16.19 (5.94)	17.04 (6.16)	0.53
Informal Practice			
Mean (*SD*)	20 (5.58)	16.38 (6.15)	-2.37*

* $p < .05$
KIMS = Kentucky Inventory of Mindfulness Skills
PSS-10 = Perceived Stress Scale 10

Hypotheses 3 and 4 examined what type of and how much practice best predicts changes in mindfulness and perceived stress. Multiple regression analysis can be used to find a combination of predictor variables that best explain an outcome or dependent variable and so was appropriate to use here (Tredoux, 2002).

A correlation matrix of the outcome variables (mindfulness, perceived stress), predictor variables (continued practice), and demographic variables can be found in Table 4. Examining the correlations between variables before proceeding with multiple regression

analysis can assist in ascertaining which variables are likely to be important predictors of the outcomes variables of interest (Wilson & MacLean, 2011)

The only demographic variable with any correlation to the outcomes measures was age, which suggested that older age was significantly associated with greater mindfulness. Sex, level of education, time since completing MBSR and the engagement in other mindfulness practices were not significantly correlated with the outcome variables of interest.

Two measures of continued formal practice were intended to be used in multiple regression analysis i.e. *frequency of formal practice* captured as the number of practices in one week and *duration of formal practice* captured as minutes spent practicing each week. Using both these variables would potentially shed light on which is more important. However, the correlation between the two measures was high (r = .77) which would likely result in a problem of multicolinearity in the model. To solve this problem, Miles and Shevlin (2001) suggest combing such variables if possible. The variables were thus combined to yield a new variable *total formal practice,* reflecting the total amount (minutes) of formal practice in a typical week (frequency multiplied by duration).

Table 4
Correlation matrix for outcome, predictor and demographic variables

	Time since MBSR	Sex	Age	Education	Perceived Stress	Mindfulness	Formal practice (frequency)	Formal practice (duration)	Informal practice
Sex	.21								
Age	.24	-.02							
Education	-.07	.16	-.03						
Perceived Stress	.04	-.05	-.23	.02					
Mindfulness	-.10	.06	.27*	.14	-.59**				
Formal practice (frequency)	.21	.04	.17	-.03	-.09	.34**			
Formal practice (duration)	.07	-.01	.30*	-.07	-.06	.19	.77**		
Informal practice	.31*	.32*	.16	.09	-.24	.41**	.55**	.42**	
Other practice	-.09	.23	-.23	-.13	-.003	-.01	-.17	-.18	-.09

*p < .05, **p < .01 (2-tailed)

Two multiple regression analyses using hierarchical regression were conducted. In each case, measures of continued practice were used to predict the outcome variables of (a)

mindfulness at follow-up and (b) *perceived stress* at follow-up. *Age* was included as a predictor variable because it was found to have a significant correlation with mindfulness.

Predicting mindfulness (hypothesis 3)

In the first step of this regression, *age* and *total formal practice* were entered together to see whether, controlling for age, mindfulness could be predicted by formal mindfulness practice. In the second step amount of *informal practice* as captured by the developed scale was entered to see if this would add significantly to the model over and above formal practice. Statistics for this regression can be found in Table 5.

Table 5
Results of hierarchical regression for predictors of mindfulness (n = 60)

Predictor Variables	***B***	**SE *B***	**β**	***t***	***p***
Step 1					
$F(2,57) = 5.13$, $R^2 = .15$ $p < .01$					
(Constant)	121.24	8.49		14.28	.00
Age	0.28	0.19	0.19	1.46	.15
Total formal practice	0.40	0.20	0.30	2.34	.02
Step 2					
$F(1,56) = 4.72$, $\Delta R^2 = .07$, $R^2 = .22$, $p < .05$					
(Constant)	108.31	10.15		10.67	.00
Age	0.27	0.18	0.18	1.49	.14
Total formal practice	0.02	0.02	0.13	0.91	.37
Informal practice	0.80	0.37	0.31	2.17	.03

B = unstandardized regression coefficients, SE *B* = standard error of *B*, β = standardized regression coefficients

Age and *total formal practice* significantly predicted mindfulness at follow-up. $F(2, 57) = 5.13$, $p < .01$ and explained 15% of the variance in mindfulness scores. *Age* was not a significant predictor in the model but *formal practice* was. *Formal practice* was positively correlated with mindfulness suggesting that greater practice is associated with increases in mindfulness.

In the second step *informal practice* explained a further 7% of the variance in mindfulness scores which added significantly to the model $F(1, 56) = 4.72$, $p < .05$. *Informal practice* was also positively correlated with mindfulness i.e. more informal practice was associated with increases in mindfulness. A total of 22% of the variance in mindfulness was explained by the model which was confirmed to be significant by the ANOVA $F(3,56) = 5.22$, $p < .01$. The beta coefficients of the final model suggest that informal practice was the most important variable in the model.

It should be noted that in the final model, *formal practice* was no longer a significant variable in the model on its own $t = 0.91$, $p = .37$. This may be explained by the significantly higher levels of informal practice among people who also continued to practice formal mindfulness techniques versus those who do not (see Table 3). In other words, the variables *formal practice* and *informal practice* may explain a significant amount of the same variance in mindfulness scores.

Hypothesis 3 thus received some support: Taken together, greater *formal* and *informal practice* significantly predicted greater levels of mindfulness at follow-up.

It is plausible that more mindful people are more likely to continue practicing, however baseline mindfulness scores were not significantly correlated with *total formal practice* ($r = 0.14$, $p = .28$) or *informal practice* ($r = 0.17$, $p = .19$), which supports the hypothesised direction of the relationship i.e. more practice predicts greater mindfulness.

Predicting perceived stress (hypothesis 4)

In this second multiple regression analysis, the same model used to predict mindfulness was used to predict perceived stress. *Age* and *total formal practice* were entered in the first step followed by *informal practice* in the second step. Statistics for this regression can be found in Table 6.

Age and *total formal practice* only explained 6% of the variance in perceived stress which was not statistically significant $F(2,57) = 1.77$, $p = .18$. *Informal practice* explained a further 4% of the variance in perceived stress but the model was still not statistically significant $F(1,56) = 2.72$, $p = .10$. Hypothesis 4 was therefore not confirmed: neither *formal* nor *informal* practice significantly predicted *perceived stress.*

A further step was added into this final model to find out if level of mindfulness at follow-up would predict perceived stress since previous research has found correlations between mindfulness and perceived stress (e.g. Dobkin & Zhao, 2011; Nyklíček & Kuijpers, 2008). *Level of mindfulness* did add significantly to the model explaining a further 27% of the variance in perceived stress, $F(1,55) = 23.6$, $p < .001$. Level of *mindfulness* was correlated with perceived stress in the expected direction suggesting that as mindfulness increases, perceived stress decreases. *Mindfulness* was the most important and only significant predictor of *perceived stress* in the model.

Table 6

Results of hierarchical regression for predictors of perceived stress (n = 60)

Predictor Variables	***B***	**SE *B***	**β**	***t***	***p***
Step 1					
$F(2,57) = 1.77$, $R^2 = .06$, $p = .18$					
(Constant)	22.30	3.38		6.60	.00
Age	-0.12	0.08	-0.22	-1.62	.12
Total formal practice	-0.003	0.01	-0.06	-0.48	.63
Step 2					
$F(1,56) = 2.72$, $\Delta R^2 = .04$, $R^2 = .10$, $p = .10$					
(Constant)	26.28	4.10		6.39	.00
Age	-0.12	0.08	-0.22	-1.63	.11
Total formal practice	0.003	0.01	0.07	0.45	.65
Informal practice	-0.25	0.15	-0.25	-1.65	.10
Step 3					
$F(1,55) = 23.6$, $\Delta R^2 = .27$, $R^2 = .37$, $p < .001$					
(Constant)	50.32	6.00		8.33	.00
Age	-0.06	0.06	-0.11	-0.94	.35
Total formal practice	0.01	0.01	0.15	1.12	.27
Informal practice	-0.07	0.13	-0.07	-0.52	.60
Mindfulness (KIMS at follow-up)	-0.22	0.05	-0.59	-4.86	.00

B = unstandardized regression coefficients, SE *B* = standard error of *B*, β = standardized regression coefficients

Discussion

The aim of this study was firstly to explore whether participation in an eight-week MBSR programme is associated with significant increases in mindfulness and decreases in perceived stress and if these changes are sustained over time. The second aim of the study was to examine the role of continued mindfulness practice in sustaining these benefits.

The long-term benefits of MBSR

The results firstly showed that for the participants in this study, participation in the MBSR programme was associated with significant increases in mindfulness (as measured by the KIMS) and decreases in perceived stress (as measured by the PSS-10) immediately after the eight-week programme. Because this study design was quasi-experimental and lacked a control group, and analysis was correlational, inferences regarding causation cannot be made. However, the results are consistent with previous experimental studies that have demonstrated the immediate benefits of MBSR in increasing mindfulness (Carmody, Baer, Lykins, & Olendzki, 2009; Dobkin & Zhao, 2011; Nyklíček & Kuijpers, 2008; Vøllestad et al., 2011) and decreasing perceived stress(Carmody et al., 2009; Carmody & Baer, 2008; Dobkin, 2008; Dobkin & Zhao, 2011; Nyklíček & Kuijpers, 2008; Pbert et al., 2012).

The results further suggest that the benefits of the MBSR programme are sustained over time as follow-up measures of mindfulness and perceived stress remained significantly improved compared to baseline measures. The follow-up period varied from nine months to several years, which suggests that the benefit of the programme endure far beyond the programme itself. The study was conducted in a 'real world' setting and not under experimental conditions therefore it is possible that in the follow-up period participants were exposed to other events or experiences which affected the outcome measures under investigation (history effects) but, the results are in line with prior experimental research that has demonstrated the sustained benefits of the MBSR programme. Pbert et al. (2012), for example, demonstrated sustained improvements at 10 weeks, 6 and 12 months post-intervention in perceived stress in a randomised controlled trial (RCT) with asthma patients who participated in the MBSR programme.

Aside from perceived stress, this study demonstrated that gains made in mindfulness skill after participation in MBSR also appear to be sustained over time (Table 2). This may be an important aspect of the programme that helps to sustain its benefits since increases in mindfulness have been associated with several positive outcomes for mental health including enhanced behavioural regulation and sense of well-being and decreased psychological

symptoms and emotional reactivity (Keng, Smoski, & Robins, 2011). Previous research has also demonstrated the association between increases in mindfulness and decreases in perceived stress(Chiesa & Serretti, 2009; Dobkin & Zhao, 2011; Nyklíček & Kuijpers, 2008). This finding was replicated in this study.

The role of continued practice

This study replicates findings from previous research that MBSR has both immediate and long-term benefits for heterogeneous patient populations (Reibel et al., 2001) but the next question is why? What contributes to the benefits of MBSR, a relatively short programme, being sustained over long periods of time? Is the establishment of a continued mindfulness practice post-intervention important in this regard?

Although more MBSR follow-up research is emerging, to the researcher's knowledge no follow-up MBSR studies have formally assessed the role that continued mindfulness practice plays in sustaining the outcomes of the programme. Vøllestad et al. (2011) reported that the MBSR programme had sustained benefits for depression and anxiety symptoms at 6 months follow-up and also reported that 84% of participants "continued to practice mindfulness to some extent" (p. 284). In a longer follow-up, Grossman et al. (2007) reported on the sustained benefits of MBSR for patients with fibromyalgia after 3 years and reported that 76% of participants continued "some form" of regular practice (p. 229). Such studies do not explore the form or extent of continued practice and how these relate to the outcomes reported. Reporting these results together, however, seems to imply that continued practice plays a role in sustaining the benefits of MBSR. This is certainly plausible but is it the case?

This study included people who continued to practice formally and those who did not as well as people with varying levels of so-called 'informal practice'. This allowed for some comparisons to be made between people reporting varied amounts and types of practice.

It was interesting that greater informal practice was reported among participants who also continued to practice formally. This could mean that some participants are simply more likely to continue their mindfulness practice regardless of the form it takes (formal or informal). An alternative explanation is that these types of practice are related. Perhaps participants who practice formally are more likely or more able to utilise the techniques used in their formal practice in everyday situations and activities (informal practice). In other words, perhaps formal practice encourages greater informal practice by enabling greater access to mindfulness skills in ordinary situations. For example, practicing awareness of breath formally in sitting meditation may make one more likely to purposefully practice this

skill informally e.g. while working or exercising. Similarly, the practice of noticing subtle bodily sensations during the body scan may make one more likely to stop and purposefully take note of physical sensations such as tension in the body. Thus 'formal' and 'informal' practice may be incorrectly conceptualised as being separate types of practice and should perhaps be considered as being in some way continuous with each other. The fact that all participants reported some degree of informal practice is perhaps a result of the formal practice of these skills during the MBSR programme itself.

The results of the multiple regression analyses showed that greater mindfulness scores at follow-up were predicted by continued practice, which suggests that mindfulness practice does play a role in maintaining levels of mindfulness post-intervention. The finding that baseline levels of mindfulness did not predict future practice further supports the assertion that practice leads to greater mindfulness and not vice-versa. Prior research has similarly found that baseline levels of mindfulness did not predict formal practice of mindfulness during the MBSR programme(Carmody & Baer, 2008). The above suggestion that formal and informal practice are related may also help to explain why in the final model, formal practice was no longer a significant predictor of mindfulness.

Continued practice, it must be noted, explained just shy of a quarter of the variance in mindfulness scores suggesting that although practice may play a significant role in how mindful one remains after MBSR, there might be other important variables that contribute to mindfulness in the long-term. Continued practice also failed to predict changes in perceived stress. Overall participants at follow-up perceived themselves to be significantly less stressed than before the programme but these results were independent of whether they continued to practice or not (both formally or informally). If practice alone does not sustain the benefits of the MBSR programme then what does?

The magnitude of participants' desire for change and motivation to learn new coping strategies could be an important variable to consider. Also, the extent to which participants grasp and accept the skills taught in the programme could also conceivably play a role in how integrated these skills become in everyday life. Another possible explanation is that simply engaging in the MBSR programme for eight weeks initiates lasting changes in mindfulness and perceptions of stress. Nairn (1998) suggests that the skills of mindfulness "lie not in technique but in attitude" (p. 15). Perhaps it is possible that the MBSR programme creates lasting changes in several outcomes (including mindfulness and perceived stress) because it results in fundamental and enduring shifts in participants' perceptions of and attitudes toward themselves, their illness, symptoms, and/or coping ability.

In a unique synthesis of qualitative research Malpass et al. (2012) describe several participants' experiences of the therapeutic process of mindfulness-based approaches using a three-phase framework. In the first phase 'perceived safe certainty' participants feel increasingly exposed to and made aware of their use of maladaptive coping strategies through mindfulness practices that direct their attention inward. At the same time participants also become acquainted with a new way of viewing and relating to their illness, symptoms and experiences of these (i.e. with openness, curiosity and acceptance). In the second phase 'safe uncertainty', participants describe grappling with the practice of the new skills and the start of challenging old ways of thinking about and coping with their illness. In the final phase, 'grounded flexibility' participants described transformational shifts in their perspectives of and relationship with themselves and their illnesses. This is accompanied by feelings of regained control over the body and of increased agency and self-efficacy (Malpass et al., 2012). This work suggests that engagement in a mindfulness programme can, in itself, be a transformational experience.

The idea that mindfulness-based interventions work by fundamentally shifting people's perspectives is also captured in Shapiro et al.'s (2005) theory of 'reperceiving'. This theory holds that as participants engage in a process of dis-identification from their thoughts, feelings or sensations, radical shifts in perspective occur. "Rather than being immersed in the drama of our personal narrative or life story, we are able to stand back and simply witness it" (Shapiro et al., 2005, p. 377). 'Reperceiving' is hypothesised to operate through actions such as self-regulation, cognitive, behavioural and emotional flexibility, values clarification and exposure, which may all take place during engagement in the activities of MBSR. This model has received some empirical support (Carmody et al., 2009). Empirical research in the neurosciences also provides support for the role of mindfulness meditation in improving self-regulation through a number of mechanisms including cognitive processes (reappraisal, exposure, extinction and reconsolidation) and changes in perspective of the self (Hölzel et al., 2011). These mechanisms closely mirror what participants described as their experience in mindfulness-based interventions (i.e. changes in thinking and shifts in perspective) in the qualitative research described above.

Since MBSR is a largely experiential rather than didactic programme, perhaps engagement in its activities, even just for eight sessions, is sufficient to create shifts in perspective that once encountered and experienced cannot be easily 'undone' or lost. Indeed, the idea of approaching and purposefully observing one's internal experiences as a coping strategy may seem counterintuitive to someone experiencing pain or other unpleasant

symptoms. But once this way of being with and relating to such experiences is authentically encountered, perhaps there is no going back: once your perception has shifted it cannot shift back…once you are awakened, you cannot go back to sleep.

Study limitations and directions for future research

Some limitations of this study should be noted and are considered here along with possible directions for future research in this area.

Limited outcome measures. The study only considered the impact of mindfulness practice on two outcome measures i.e. mindfulness and perceived stress. This is unlikely to give a complete picture of the role of continued practice in sustaining the benefits of the MBSR programme. Continued mindfulness practice may continue to positively influence other outcomes such as mood, anxiety levels and physical symptoms that were not measured here. Future studies of continued mindfulness practice could thus endeavour to broaden the scope of outcome measures to provide a wider understanding of the relative importance of continued practice in sustaining the benefits of the MBSR programme.

In the discussion it was also suggested that the MBSR programme may result in positive outcomes as a result of the changes in perspective and attitude that it engenders. Outcome measures of the MBSR programme tend to focus on psychological outcomes and measures of symptoms. Future studies could consider ways of measuring or describing shifts in attitude, perception, behavior and/or the illness experience that may come about as a result of participation in the programme. Such investigations may provide further evidence regarding the mechanisms through which the programme exerts its effects. Using mixed methods may be a useful approach to such research.

Measurement instruments. Another limitation that can be considered is the measurement instruments used. The majority of research investigating the benefits of mindfulness-based interventions makes use of self-report measures. This is largely a necessity due to the phenomenological nature of mindfulness and the subjective nature of the outcome variables of interest. Self-report measures are, however, vulnerable to response bias i.e. participants may know what the benefits of the MBSR programme are meant to be and this expectation may influence their responses or participants who experience positive changes may be more likely to report their experiences than those who experience no benefits (Carmody et al., 2009).

Since no validated measure exists for capturing continued practice, a measure was developed for the purpose of this study. This process revealed that continued practice is not

necessarily easy or straightforward to capture. While formal and informal practice are often thought to be separate types of practice, the results suggested that they are possibly related and in future should, perhaps, be considered along a continuum. The developed measure focused on the frequency and duration of practice in the past month, which may not have been a true reflection of how much participants continued to practice post-MBSR. People's practice may not necessarily be regular and so people who indicated no continued practice at the time of the study may have practiced more regularly for a period of time in the past. Similarly, people who indicated that they continue to practice may not necessarily have maintained a regular practiced since completing the programme.

Future MBSR research that conducts follow-up assessments could more accurately measure continued formal practice by regularly tracking practice over a predefined follow-up period (e.g. using practice diaries). Some authors (Del Re, Flueckiger, Goldberg, & Hoyt, 2013) have also pointed to the importance of considering the quality of mindfulness practice rather than only the quantity. Practicing does not only entail how long or how often one practices but also *how* one is practicing. Del Re et al., (2013) developed a scale to monitor practice quality, which demonstrated positive associations with various psychological symptoms. Future measurement instruments of continued practice should thus consider practice quality as an added dimension.

Characteristics of the sample. Some aspects of the sample may also be considered to be limitations of this study. Participants in this study were mostly female and had high levels of education. This makes it less possible to generalise the findings to males and people with lower levels of education. Participants in the study were also self-selected i.e. they volunteered to be involved in the research and there is thus a possibility that the sample is not representative of the population under investigation i.e. all voluntary MBSR participants. It is also possible that people who chose to respond to the Internet survey were motivated to do so because they particularly enjoyed or benefited from the programme and/or because they see research in this area as being particularly valuable or important (Wilson & MacLean, 2011).

These limitations are in part the result of the quasi-experimental study design and may be avoided in future by using more rigorous designs such as RCTs. Having said that, however, the fact that this research was conducted in a real world setting may also be considered a strength. Experimental conditions can have the disadvantage of limiting external validity while 'real world' research may offer insight into the effects of an existing service or programme.

The MBSR programme has continuously been associated with a number of positive benefits for mental and physical health. Presently, the MBSR programme is only available to people using the private health care system in South Africa but a strong argument may be made for including such an intervention in the overburdened and under-resourced public health care system. The programme is relatively short, is conducted in groups and has been associated with long-term benefits for a wide variety of people experiencing several different health conditions. These aspects of the programme are of note and suggest that MBSR may be considered to be a cost-effective as well as effective intervention. Future studies in the South African context might explore the efficacy and feasibility of offering such a programme to people using the public health care system for a variety of conditions including HIV/AIDS, cancer, chronic pain conditions, and mood/anxiety disorders.

Conclusion

This study adds to the literature regarding the long-term benefits of the MBSR programme in increasing mindfulness and decreasing perceived stress among heterogeneous clinical populations. In this study, the role of continued mindfulness practice in sustaining the benefits of the MBSR programme was also explored. The results showed that practice is important for maintaining levels of mindfulness over time. The finding that continued practice was not related to perceptions of stress could suggest that engagement in the MBSR programme itself plays an important role in creating lasting change in participant's perceptions of stress. It was hypothesised that the MBSR programme fosters transformational changes in attitude and perception toward oneself and one's experiences, which may be an important mechanism by which the programme facilitates positive change. Finally, suggested directions for future research included assessing the role of continued mindfulness practice in sustaining other outcomes of interest and refining the measurement and operationalisation of continued mindfulness practice. On a broader scale, it was suggested that the utility of the MBSR programme should be explored in new and more diverse contexts since the programme has the potential to be a cost-effective intervention with long lasting benefits for health and well-being.

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Appendix A
Ethics approval for MRC study

SOUTH AFRICAN MEDICAL RESEARCH COUNCIL

ETHICS COMMITTEE

PO Box 19070, Tygerberg 7505, Cape Town, South Africa
Francie van Zijl Drive, Parow Valley 7500
Tel: +27 (0)21 938 0341; Fax: +27 (0)21 938 0201
E-mail: adri.labuschagne@mrc.ac.za
http://www.sahealthinfo.org/ethics/ethics.htm

11 April 2013

Ms A Gevers
Gender and Health Research Unit
MRC Cape Town

Dear Ms Gevers

Protocol ID: EC001-3/2013
Protocol title: Examining the impact of mindfulness-based stress reduction on medical symptomology, stress and emotional regulation
Meeting date: 26 March 2013

Thank you for your application to the Committee, which was discussed at the March 2013 meeting, as well as your response dated 2 April 2013. I am pleased to inform you that ethics approval is now granted for the study.

Please note that the approval is valid for 1 year, i.e. from 26 March 2013 to 25 March 2014. Any changes to the research protocol must be submitted as an amendment. Any protocol deviations have to be reported.

Wishing you well with your research.

Yours sincerely

PROF. D DU TOIT
CHAIRPERSON: MRC ETHICS COMMITTEE

Appendix B

Email invitations to MBSR participants

E-mail 1 (16 June 2013)
SUBJECT: Important survey coming soon

UNIVERSITY OF CAPE TOWN
Department of Psychology

An important research survey will be emailed to you in the next few days. Please look out for this email and consider completing the on-line survey.

The Institute for Mindfulness South Africa (IMISA) supports research into mindfulness-based interventions such as the Mindfulness-Based Stress Reduction programme (MBSR) which you have completed. Continued research contributes to the growing evidence and knowledge base for mindfulness-based interventions. The current research project is being run independently at the University of Cape Town.

More details about this survey will be included in the next email. Your participation will be highly valued and appreciated. In exchange for your time, you will receive two exciting gifts!

Kind regards

Tessa Eidelman (principal researcher)
E-mail: teidelman@gmail.com
Tel: 082 417 6512
Institution: Department of Psychology, University of Cape Town.

Appendix B (cont…)

Email 2 (19 June 2013)

SUBJECT: MBSR Survey – Request for assistance

UNIVERSITY OF CAPE TOWN
Department of Psychology

As a graduate of the MBSR programme, your assistance is requested in conducting research into the long-term outcomes of the MBSR programme. Please consider completing this on-line survey (link below), which will take between 10 and 20 minutes. The survey includes two questionnaires you have filled in before (once before and once after MBSR) plus a few additional questions.

https://www.surveymonkey.com/s/mbsrsurvey

I am a psychology student at the University of Cape Town and this research is in partial fulfilment of my honours degree. I would thus be very grateful for your assistance. The short time frame of the research also means that the survey will only be available for a short period.

In anticipation of your help and to thank you for your time, please find attached a voucher for R20 off your next yoga class at GuruRamDas yoga studio in Cape Town. Simply print this email, fill in your name, and take it along to the studio. If you complete the survey, you will receive an additional voucher for 20% of any mindfulness meditation CD from *be-awake*. Go to www.be-awake.co.za to check out the beautiful CD's on offer.

If you have any questions about this research, please feel free to contact me: Tessa Eidelman at teidelman@gmail.com or on 082 417 6512.

Many thanks in advance

Tessa Eidelman (principal researcher)
Department of Psychology, University of Cape Town.

GURURAMDAS YOGA STUDIO

021 424 6610
www.gururamdas.co.za

Thanks for your help!
This voucher entitles you to
R20 off one yoga class
Valid until 31 August 2013

Name: _____

Appendix C

Reminder emails to MBSR participants

Email 3 (27 June 2013)
SUBJECT: Thank You!

UNIVERSITY OF CAPE TOWN
Department of Psychology

THANK YOU so much to all of you who have already completed the on-line MBSR survey. I am very grateful for your assistance with this research project.

If you have not yet completed this survey, there is still time to do so. Simply follow the link below to complete the survey and receive your voucher for 20% off mindfulness meditation CD's from *be-awake* (www.be-awake.co.za).

https://www.surveymonkey.com/s/mbsrsurvey

If you have any questions about this research, please feel free to contact me: Tessa Eidelman at teidelman@gmail.com or on 082 417 6512.

Many thanks for your assistance

Tessa Eidelman (principal researcher)
Department of Psychology, University of Cape Town.

Appendix C (cont…)

Email 4 (7 July 2013)
SUBJECT: A final reminder

UNIVERSITY OF CAPE TOWN
Department of Psychology

This is a final request to please complete the MBSR on-line survey if you have not managed to do so already. The survey will only be available for a few more days. Please follow the link below to complete the survey. It will take between 10 and 20 minutes to complete and you will receive a discount voucher for 20% off mindfulness mediation CD's from *be-awake* (www.be-awake.co.za).

https://www.surveymonkey.com/s/mbsrsurvey

If you have any questions about this research, please feel free to contact me: Tessa Eidelman at teidelman@gmail.com or on 082 417 6512.

Many thanks for your assistance

Tessa Eidelman (principal researcher)
Department of Psychology, University of Cape Town.

Appendix D
Thank you email with voucher

Email 5 (on completion of survey)
SUBJECT: Thank you! Your be-awake voucher is attached.

Dear

Thank you for completing the MBSR survey – your assistance is greatly appreciated. Attached please find your be-awake voucher.

To apply your discount, simply go to be-awake.co.za, browse the CD's on offer then e-mail Viv at vzaaks@gmail.com with the titles of the CD's you would like to buy and this voucher. She will then give you the adjusted price and options for posting or collecting the CD's.

If you have any problems using this voucher you can contact me.

With thanks

Tessa Eidelman
teidelman@gmail.com
082 417 6512

Appendix E

Mindfulness-based stress reduction follow-up survey

1. What is your full name?*

   *an answer to this question is required in order to link your responses to your previous responses.

2. When did you participate in MBSR?

   2007 2008 2009 2010 2011 2012 Not sure

3. Kentucky Inventory of Mindfulness Skills

   Please rate each of the following statements using the scale provided. Choose the number that best describes your own opinion of what is generally true for you.

   1 = Never or very rarely true
   2 = Rarely true
   3 = Sometimes true
   4 = Often true
   5 = Very often or always true

   3.1. I notice changes in my body, such as whether my breathing slows down or speeds up
   3.2. I'm good at finding the words to describe my feelings
   3.3. When I do things, my mind wanders off and I'm easily distracted
   3.4. I criticize myself for having irrational or inappropriate emotions
   3.5. I pay attention to whether my muscles are tense or relaxed
   3.6. I can easily put my beliefs, opinions, and expectations into words
   3.7. When I'm doing something, I'm only focused on what I'm doing, nothing else
   3.8. I tend to evaluate whether my perceptions are right or wrong
   3.9. When I'm walking, I deliberately notice the sensations of my body moving
   3.10. I'm good at thinking of words to express my perceptions, such as how things taste, smell, or sound
   3.11. I drive on "automatic pilot" without paying attention to what I'm doing
   3.12. I tell myself that I shouldn't be feeling the way I'm feeling

3.13. When I take a shower or bath, I stay alert to the sensations of water on my body
3.14. It's hard for me to find the words to describe what I'm thinking
3.15. When I'm reading, I focus all my attention on what I'm reading
3.16. I believe some of my thoughts are abnormal or bad and I shouldn't think that way
3.17. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions
3.18. I have trouble thinking of the right words to express how I feel about things
3.19. When I do things, I get totally wrapped up in them and don't think about anything else
3.20. I make judgments about whether my thoughts are good or bad
3.21. I pay attention to sensations, such as the wind in my hair or sun on my face
3.22. When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words
3.23. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted
3.24. I tend to make judgments about how worthwhile or worthless my experiences are
3.25. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing
3.26. Even when I'm feeling terribly upset, I can find a way to put it into words
3.27. When I'm doing chores, such as cleaning or laundry, I tend to daydream or think of other things
3.28. I tell myself that I shouldn't be thinking the way I'm thinking
3.29. I notice the smells and aromas of things
3.30. I intentionally stay aware of my feelings
3.31. I tend to do several things at once rather than focusing on one thing at a time
3.32. I think some of my emotions are bad or inappropriate and I shouldn't feel them
3.33. I notice visual elements in art or nature, such as colours, shapes, textures, or patterns of light and shadow
3.34. My natural tendency is to put my experiences into words
3.35. When I'm working on something, part of my mind is occupied with other topics, such as what I'll be doing later, or things I'd rather be doing
3.36. I disapprove of myself when I have irrational ideas
3.37. I pay attention to how my emotions affect my thoughts and behaviour
3.38. I get completely absorbed in what I'm doing, so that all my attention is focused on it
3.39. I notice when my moods begin to change

4. Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, choose the number that best describes how often you felt or thought a certain way.

0 = Never
1 = Almost Never
2 = Sometimes
3 = Fairly Often
4 = Very Often

4.1. In the last month, how often have you been upset because of something that happened unexpectedly?
4.2. In the last month, how often have you felt that you were unable to control the important things in your life?
4.3. In the last month, how often have you felt nervous and "stressed"?
4.4. In the last month, how often have you felt confident about your ability to handle your personal problems?
4.5. In the last month, how often have you felt that things were going your way?
4.6. In the last month, how often have you found that you could not cope with all the things that you had to do?
4.7. In the last month, how often have you been able to control irritations in your life?
4.8. In the last month, how often have you felt that you were on top of things?
4.9. In the last month, how often have you been angered because of things that were outside of your control?
4.10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

5. Practice

The following questions pertain to formal meditation practices learnt during the MBSR programme i.e. sitting meditation, walking meditation, the body scan and mindful yoga.

5.1. Do you continue to practice any of these techniques? Y/N

5.2. If yes, consider a typical month - how many days a week do you practice each of these?

5.2.1. Sitting meditation 1 2 3 4 5 6 7

5.2.2. Walking meditation 1 2 3 4 5 6 7

5.2.3. Body Scan 1 2 3 4 5 6 7

5.2.4. Mindful Yoga 1 2 3 4 5 6 7

5.3. On average, how long do you spend on each of these at one time? Please give your answer in **minutes**.

5.3.1. Sitting meditation _____ minutes

5.3.2. Walking meditation _____ minutes

5.3.3. Body Scan _____ minutes

5.3.4. Mindful Yoga _____ minutes

5.4. Do you currently engage in any other type of mindfulness practice? E.g. Tai Chi, Qi Gong, other yoga/meditation Y/N

5.5. If yes, how many days a week do you typically practice these?

5.5.1. Tai Chi 1 2 3 4 5 6 7

5.5.2. Qi Gong 1 2 3 4 5 6 7

5.5.3. Other types of yoga 1 2 3 4 5 6 7

5.5.4. Other types of meditation 1 2 3 4 5 6 7

5.5.5. Other (please specify) 1 2 3 4 5 6 7

5.5.6. Other (please specify) 1 2 3 4 5 6 7

5.6. On average, how long do you spend on each of these at one time? Please give your answer in **minutes**.

5.6.1. Tai Chi _____ minutes

5.6.2. Qi Gong _____ minutes

5.6.3. Other types of yoga _____ minutes

5.6.4. Other types of meditation _____ minutes

5.6.5. Other (please specify) _____ minutes

5.6.6. Other (please specify) _____ minutes

5.7. The following questions pertain to more informal practices of mindfulness. Please choose the number that best captures how often you engage in these practices in a typical **week**.

1 = Never
2 = 1-2 times in a week
3 = 3-4 times in a week
4 = 5-6 times in a week
5 = every day
6 = more than once a day
7 = several times a day

5.7.1. How often do you *purposefully* do an ordinary daily activity with awareness e.g. eating, doing the dishes or other chores, driving, having a shower, conversing with others, playing with children, making tea

5.7.2. How often do you *purposefully* bring awareness to the breath during the day

5.7.3. How often do you *purposefully* bring awareness to thoughts and/or feelings during the day

5.7.4. How often do you *purposefully* bring awareness to movement or sensations in the body during the day e.g. while walking, exercising or doing a daily activity.

6. <u>Demographic questions:</u>

6.1. Date of birth dd/mm/yyyy

6.2. Sex M F

6.3. Level of education

Some high school
Graduated high school
Some tertiary education
Undergraduate degree/diploma/certificate
Some postgraduate education
Postgraduate degree/diploma/certificate

Appendix F

Informed consent form

Please read the following important information.

Thank you for taking the time to complete this survey. It should take 10-20 minutes. The purpose of this research is to investigate the long-term effects of the MBSR programme and what contributes to these outcomes.

You may recall completing questionnaires at the start and end of MBSR. Two of these are repeated here along with some other questions. Your name is required only for the purposes of linking your current answers to your previous answers. By clicking 'I agree', you give permission for the researcher to access your previous answers and to use these along with your current answers for research purposes. The researcher will also verify the date that you completed MBSR. No other personal information will be accessed. Your name will not appear in the reporting of the results and the facilitators of MBSR will not know who has responded. Data will be recorded without names and once this process is complete, your on-line survey responses will be deleted. Data will be stored on a password-protected computer that only the researcher has access to.

Please answer this survey honestly. You may choose to opt-out at any time by closing your browser. If you opt-out this will not affect your relationship with the facilitators of the MBSR programme.

To thank you for completing the survey you will receive a DISCOUNT voucher for any be-awake CD of your choice. This voucher will be emailed to you once you have completed the survey.

If you have any questions or concerns about this research, please feel free to make contact.

A summary of the results of this study will be made available on the IMISA website when the study is completed (www.mindfulness.org.za).

With thanks

Tessa Eidelman (principal researcher)

E-mail: teidelman@gmail.com

Tel: 082 417 6512

Institution: Department of Psychology, University of Cape Town.

Johann Louw (ethics chair)

E-mail: johann.louw@uct.ac.za

Tel: 021 650 3414

Institution: Department of Psychology, University of Cape Town.