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Original Research

Mindfulness-based stress reduction improves distress in two different chronic illnesses

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Abstract

Background: Distress is well recognized as endemic in cancer populations: less is known about distress in Irritable Bowel Syndrome (IBS). Purpose: This study compared distress between individuals with IBS (n=51) and those with cancer (n=147) participating in Mindfulness-Based Stress Reduction (MBSR). Methods: Patients completed mood and symptoms of stress questionnaires pre- and post- MBSR intervention as well as at 6-month follow-up. Results: The IBS group demonstrated higher baseline total symptoms of stress and more muscle tension, sympathetic nervous system arousal, and neurological/GI symptoms. They also had higher baseline tension/anxiety scores on the mood measure. While both groups decreased significantly post-MBSR on total stress symptoms and mood disturbance scores, the IBS group showed a small increase in stress symptoms between post-program and 6-month follow-up. Conclusions: These findings highlight the high levels of distress associated with IBS, and support evidence that MBSR may be beneficial in reducing both IBS and cancer related distress.

INTRODUCTION

Irritable Bowel Syndrome (IBS) is a functional gastrointestinal (GI) disorder characterized by chronic and often debilitating physical symptoms such as abdominal pain, flatulence, bloating, and atypical bowel function. Recent epidemiological literature estimates 5% - 10% of North Americans suffer from IBS, with an economic burden of over $20 billion in medical costs and lost workplace productivity [1]. As a functional disorder, there are no physiological abnormalities known to cause IBS symptoms. Overall, there are currently no universally accepted medical options or pharmacological regimes effective for managing the broad range of IBS symptoms [2].

Given the lack of conventional medical and pharmacological treatments effective in relieving IBS symptoms, attention has shifted toward a biopsychosocial conceptualization of IBS. Based on the brain-gut axis theory [3, 4], IBS symptoms occur and are exacerbated through a combination of intestinal motor, sensory, and central nervous system activities. Cognitive and emotional arousal activates the autonomic nervous system which can result in changes in GI secretions, blood flow, and muscle activity [4]. Resulting sensations such as bloating, cramping, or muscle contractions may provoke further psychological arousal such as frustration, feelings of suffering, and anticipatory anxiety.

Influenced by increased evidence for the brain-gut axis theory, the relation between psychological factors such as mood and stress symptoms, and exacerbated IBS symptomatology is becoming more recognized. In a community sample, those with IBS symptoms experienced significantly higher scores in measures of depression, anxiety, hostility, muscle stiffness, and fatigue compared to those not reporting IBS symptoms

[5]. In general, psychological stress, including a history of abuse and a maladaptive coping style, predicts poorer health outcomes and more severe IBS symptoms [6]. Given these strong associations among psychological factors and IBS symptoms, addressing psychological distress may reduce IBS symptom severity. Although evidence supports hypnotherapy, cognitive behavioral therapy and dynamic psychotherapy for global IBS symptom reduction compared to usual care, only a subset of patients respond and potential mechanisms are not fully understood [7].

Alternative psychological therapies such as Mindfulness Based Stress Reduction are gaining research attention, and evidence is emerging that Mindfulness Based Stress Reduction (MBSR) may be beneficial in reducing IBS symptoms. MBSR is an 8-week intervention where participants learn and practice mindfulness meditation techniques and Hatha yoga in weekly group classes and are encouraged to practice the learned skills at home throughout the course [8, 9]. In a recently published randomized controlled trial, 75 women with IBS were randomized to either an MBSR intervention or a group social support condition [10]. MBSR participants experienced clinically significant reductions in IBS symptom severity scores immediately post-intervention compared to the control group, and at 3-month follow-up experienced improvements in overall quality of life, and reductions in anxiety, somatization, and visceral sensitivity relative to the control group [10]. A randomized controlled trial of MBSR compared to a treatment-as-usual waitlist revealed similar improvements in IBS symptom severity as well as reductions in symptoms of stress [11]. Garland and colleagues tested therapeutic mediators of the effect of MBSR on IBS severity and quality of life [12]. Results suggest that MBSR exerts therapeutic effects on IBS symptoms by enhancing nonreactivity to catastrophic appraisals and gut focused anxiety, while also refocusing attention to interoceptive information that is less emotionally charged [12]. These results highlight the range of potential psychological and physiological benefits that MBSR may exert on individuals with IBS symptoms, as well as potentially increasing benefits over time.

Much of the large scale, extensive research into the benefits of MBSR has been conducted in cancer populations. The extent and consequences of distress in cancer are well documented [13, 14] with anywhere from 35-55% of all patients reporting clinically significant levels of distress [14-16]. A meta-analysis of ten studies of MBSR in oncology settings demonstrates the efficacy of MBSR for reducing psychological symptoms including anxiety, depression and stress (Cohen's effect size d = 0.48) [17]. In a randomized wait-list controlled trial of 90 individuals with various cancer types and stages, patients experienced a 65% reduction in total mood disturbance and a 31% reduction in symptoms of stress after participating in a MBSR intervention [18].

Rationale

Cancer is a potentially life-threatening disease with treatments (e.g., surgery, radiation, chemotherapy) that can produce severe adverse side effects that are well recognized as highly distressing [19]. Irritable Bowel Syndrome (IBS), on the other hand, is a non-life threatening functional disorder that is also associated with distress [3-6]. However, IBS is a disorder with no known organic cause, high psychological comorbidity [20], and, compared to similar bowel disorders (e.g., Irritable Bowel Disease), more perceived stigma from health care providers [21]. Such factors may draw attention away from the legitimacy of IBS related distress. A comparison of patients with a disease such as cancer (that is well recognized as highly distressing) with those experiencing IBS will allow for further understanding of the severity of distress in individuals with IBS. In addition, comparing the relative efficacy of MBSR as a treatment for elevated distress will shed light on the potential of MBSR to treat distress regardless of the etiology of the distress.

Objectives

1) To compare baseline distress levels (mood disturbance and symptoms of stress) between cancer patients and IBS sufferers who have signed up for an MBSR class, and;

2) To compare the efficacy of the intervention between groups.

METHOD

Participants

As part of a larger ongoing clinical trial, baseline, post-intervention, and 6-month follow-up data were collected between 2007 and 2009 from individuals diagnosed with IBS (n = 51) who self-referred to a MBSR intervention or were identified by medical chart review and recruited by phone through multiple gastroenterologists' clinics within the community. Individuals from the community with cancer (n = 147) of mixed diagnoses self-referred to a MBSR intervention between 1998 and 2001. Data were amalgamated into a single database for use in this investigation, approved by the Conjoint Health Research Ethics Board of the University of Calgary.

Treatment Protocol

All participants took part in an 8-week manualized

MBSR program [8, 9, 18, 22]. The protocol was administered to the patient groups separately. Individuals with cancer were able to choose among morning and evening class times, and the program for individuals with IBS symptoms was offered in the evening. Programs for both groups were offered in the fall, winter, and spring. Although a potential for variance may exist between the cancer and IBS program group content, facilitators were instructed to deliver the program consistently utilizing a manual established by Speca and colleagues [18], based on the program developed by Kabat-Zinn [9]. The same instructor who taught all of the IBS classes also taught two-thirds of the cancer classes. The program emphasizes discussion about meditation experiences rather than specific symptomology, and components of the program do not target any one illness type or symptom. Small group discussion and homework exercises within the program focus on mindfulness meditation, yoga practices, and problem-solving barriers to home practice.

Measures

The outcomes investigated were symptoms of stress and mood disturbance. Stress symptoms were measured using the Calgary Symptoms of Stress Inventory (CSOSI) [23]. The CSOSI is a 56-item instrument clustered into eight subscales measuring physical, psychological and behavioral responses to situations perceived to be stressful. This measure has good internal consistency, good face validity, and excellent convergent and divergent validity with other scales [23]. Mood disturbance was measured using the Profile of Mood States (POMS) [24] which is a 65-item instrument measuring state (vs. trait) attributes, thus is appropriate for longitudinal study designs. The POMS yields a score on six dimensions of mood and an overall total mood disturbance score, and has been widely used in psychiatric and medical populations. In both measures, higher scores represent higher levels of distress and mood disturbance.

Data Analysis

All data analyses were carried out using SAS 9.2. A series of independent-samples t-tests or chi squared analyses were conducted to compare the two groups at pre-intervention on psychological and demographic variables. A piecewise multilevel hierarchical linear regression (HLM) model was utilized to compare baseline differences between individuals with IBS symptoms and individuals with cancer pre-intervention, and to identify within and between group changes on each outcome from pre- to post-intervention as well as post-intervention to 6-month follow-up. The mixed model procedure was fit for piecewise growth modeling [25, 26], and square-root transformations were utilized if appropriate to improve the fit of the model. Multilevel HLM is an appropriate statistical choice for longitudinal studies with unbalanced populations and missing data [27, 28]. HLM eliminates potential biases caused by the removal of data supplied by participants who did not complete all components of the study. The HLM methodology is described in detail by Oman and colleagues [28].

RESULTS

Demographics and Baseline Characteristics:

Data from individuals diagnosed with cancer (n=147) or IBS (n=51) were analyzed for baseline demographic characteristics. Cancer and IBS groups differed only in mean age, $t(196) = 4.14$, $p < .001$ with the cancer group (M = 53 years, SD = 10.65) being significantly older than the IBS group (M = 45 years, SD = 15.93). Both patient groups had a mean education of 15 years and the total sample was composed primarily of female participants with 90% and 82% female in the IBS and cancer patient groups respectively.

The estimates of piecewise growth trajectories in Table 1 show that, at baseline, the IBS group demonstrated higher CSOSI total scores than the cancer group $p <.05$, and higher scores in the CSOSI subscales of muscle tension $p < .0001$, sympathetic arousal $p <.05$, and neurological/GI symptoms $p < .0001$. The estimates of piecewise growth trajectories in Table 2 show the IBS group had significantly higher tension-anxiety subscale scores than the cancer group at baseline (p=.04). No other differences in mood scores or symptoms of stress were found between the two groups.

Attrition:

In the cancer group, 131 (88%) individuals completed the intervention and 97 (74%) completed the 6-month follow-up assessment. In the IBS group, 32 (63%) completed the intervention and 28 (88%) completed the 6-month follow-up. The pre- to post-MBSR attrition rate for IBS participants, though not for cancer participants, is high compared to other MBSR intervention studies in chronically ill populations, including cancer and IBS groups (10, 29, 30). However, in the total sample no significant differences were identified between those who completed and those who did not complete the study in terms of demographic variables, baseline symptoms of stress scores or baseline mood scores. Similarly, when completers of each patient group were compared to non-completers within their group, no significant differences were revealed. Despite attrition, due to the utilization of HLM, data provided by all 198 participants were included in the analysis. Missing data and unbalanced groups were accounted and adjusted

for by the analyses [27, 28].

Outcome Analyses:

Symptoms of Stress:

Multilevel HLM modeling revealed a main effect of time for CSOSI total scores: regardless of group membership, scores significantly decreased from baseline measure to post-MBSR intervention $F(300) = 53.74$, $p < .0001$, and significantly increased from post-intervention assessment to 6-month follow-up $F(270) = 4.24$, $p < .05$. A significant time by group interaction was not identified, indicating that both groups decreased equally in CSOSI total scores from baseline to post-MBSR, then both increased equally in CSOSI total scores from post-MBSR to 6-month follow-up (Figure 1).

Table 1 also shows significant decreases in CSOSI scores between baseline and post-MBSR for all CSOSI subscales: depression ($p < .01$), anger ($p = .01$), sympathetic arousal ($p < .001$), muscle tension ($p < .01$), cardiopulmonary arousal ($p < .01$), cognitive disorganization ($p < .01$), neurological/GI ($p < .01$), and upper respiratory symptoms ($p < .05$). An interaction effect was shown for sympathetic arousal ($p < .05$) and neurological/GI ($p < .05$) from baseline to post-MBSR, where the decrease was steeper in the IBS group than in cancer group. No other interaction effects were found for the symptoms of stress subscale scores during the intervention period. The decreases from baseline to post-intervention were maintained at 6-month follow-up for depression, muscle tension, cardiopulmonary, neurological/GI, cognitive and upper respiratory symptoms. However, sympathetic arousal ($p < .01$), and anger ($p < .05$) significantly increased during the 6-month follow-up period. A significant time by group interaction effect was found for anger ($p < .05$), with the cancer group maintaining the decrease at 6-month follow-up while the IBS group did not.

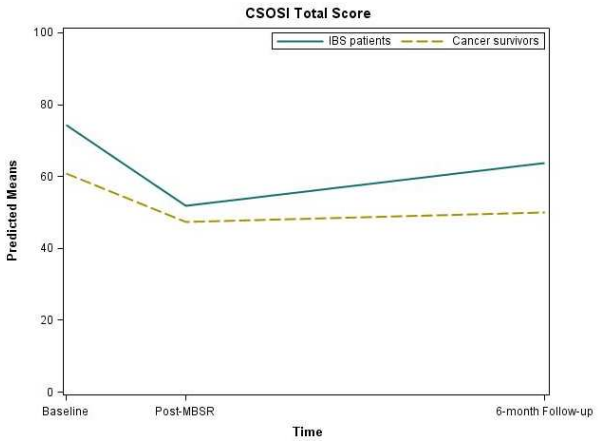

Figure 1. Total stress scores for IBS patients and cancer patients pre-, post-, and 6-months post-MBSR

Table 1. Change estimates in CSOSI sub-scores and Total scores from *Piecewise Growth Model Analyses*

	Depression¶		Anger		Sympathetic Arousal		Muscle Tension		Cardio-pulmonary Arousal¶		Cognitive Disorganization		Neurological/ GI¶		Upper Respiratory Symptoms¶		Total CSOSI score	
Effect	Est	SE	Est	SE	Est	SE	Est	SE	Est	SE	Est	SE	Est	SE	Est	SE	Est	SE
Baseline																		
Intercept	2.52 (***)	0.18	8.67 (***)	0.77	16.45 (***)	1.05	15.52 (***)	1.00	1.82 (***)	0.17	6.23 (***)	0.59	2.40 (***)	0.16	2.34 (***)	0.14	74.29 (***)	4.52
Group	0.06	0.21	0.31	0.89	-2.93 (*)	1.22	-4.91 (***)	1.16	-0.25	0.20	0.35	0.69	-0.91 (***)	0.19	-0.11	0.17	-13.36 (*)	5.24
Intervention																		
Changes	-0.31 (**)	0.11	-1.43 (**)	0.44	-2.49 (***)	0.52	-2.08 (**)	0.56	-0.25 (**)	0.10	-1.06 (**)	0.33	-0.32 (**)	0.09	-0.17 (*)	0.08	-11.21 (***)	2.21
Time x Group	0.06	0.12	0.14	0.49	1.22 (*)	0.58	0.98	0.63	0.08	0.11	0.30	0.37	0.24 (*)	0.10	-0.01	0.09	4.41†	2.46
Follow-up																		
Changes	0.04	0.04	0.35 (*)	0.16	0.49 (**)	0.19	0.31	0.20	0.06†	0.03	0.08	0.12	0.06†	0.03	0.05	0.03	1.96 (*)	0.79
Time x Group	-0.05	0.04	-0.35 (*)	0.18	-0.34	0.21	-0.12	0.23	-0.05	0.04	-0.10	0.13	-0.06†	0.08	-0.02	0.03	-1.52†	0.89

Square-root Transformation. † p< 0.10; (*) p< 0.05; (**) p< 0.01; (***) p< 0.001.

Profile of Mood States:

HLM modeling revealed a time effect for POMS total scores, but only from baseline to post-intervention. Overall, scores significantly decreased from baseline measure to post-MBSR intervention $F(317) = 30.72$, $p < .0001$, but remained stable from post-MBSR to 6-month follow-up. There were no significant group by time interactions, thus both groups decreased equally in POMS total scores, and maintained that decrease at the 6-month follow-up assessment (Figure 2).

Table 2 displays the estimates of piecewise growth trajectories for the POMS subscale scores. Analyses revealed significant decreases in subscale scores between baseline and post-MBSR for tension-anxiety ($p < .001$), depression-dejection ($p < .01$), fatigue ($p < .01$), and confusion ($p < .01$). These changes were maintained at 6-month follow-up. There were no changes for anger-hostility and vigor subscale scores from baseline to post-MBSR. There was a significant time by group interaction for tension-anxiety ($p < .01$) and confusion ($p < .05$) in the intervention period, where the IBS group decreased more than the cancer group for both subscales. No significant differences were identified between the cancer and IBS groups from post-MBSR to 6-month follow-up in any of the POMS domains.

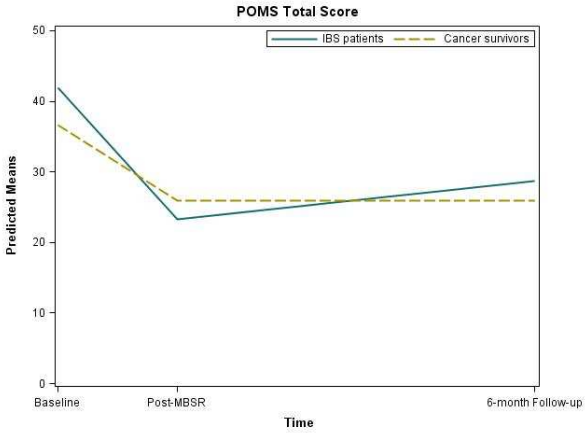

Figure 2. Total mood scores for IBS patients and cancer patients pre-, post-, and 6 months post-MBSR

Table 2. Change estimates in POMS sub-scores and Total scores from *Piecewise Growth Model Analyses*

	Tension-anxiety		Depression-dejection¶		Anger-hostility¶		Vigor		Fatigue		Confusion¶		POMS Total scores	
Effect	Est	SE	Est	SE	Est	SE	Est	SE	Est	SE	Est	SE	Est	SE
Baseline														
Intercept	12.94 (***)	0.76	3.02 (***)	0.22	2.48 (***)	0.19	13.92 (***)	0.88	12.00 (***)	0.94	2.92 (***)	0.11	41.92 (***)	4.50
Group	-1.80 (*)	0.88	0.06	0.26	0.17	0.22	0.64	1.02	-1.36	1.09	-0.03	0.12	-5.34	5.22
Intervention														
Changes	-2.19 (***)	0.46	-0.40 (**)	0.13	-0.13	0.11	0.32	0.53	-1.45 (**)	0.54	-0.22 (**)	0.06	-9.32 (**)	2.55
Time x Group	1.35 (**)	0.52	0.14	0.14	-0.08	0.12	0.33	0.60	0.72	0.61	0.14 (*)	0.07	4.01	2.85
Follow-up														
Changes	0.01	0.17	0.05	0.05	0.0002	0.04	-0.23	0.19	-0.23	0.19	0.02	0.02	0.91	0.92
Time x Group	-0.05	0.19	-0.05	0.05	-0.02	0.04	0.26	0.22	0.26	0.22	-0.01	0.03	-0.90	0.92

Square-root Transformation. † p< 0.10; (*) p< 0.05; (**) p< 0.01; (***) p< 0.001.

DISCUSSION

It was expected that both groups would experience distress at baseline, and benefit from MBSR as a distress reduction intervention. Results showed that the individuals with IBS experienced greater distress than individuals with cancer, particularly in the domains of muscle tension, sympathetic arousal and neurological/GI symptoms. Increased sympathetic arousal may exacerbate and increase symptom-related anxiety, attention and sensitivity, further fueling the cyclical reinforcing nature of IBS symptoms, exacerbating psychological distress and vice versa [4]. With the exception of the IBS group having higher baseline tension/anxiety subscale scores, both the IBS and cancer groups demonstrated similar levels of mood disturbance prior to the intervention, and similar levels of distress in the remaining symptoms of stress domains (depression, anger, cardiopulmonary arousal, cognitive disorganization, and upper respiratory symptoms). That people with a chronic but not life-threatening illness would experience distress levels similar to cancer patients is interesting, and suggests that such chronic illnesses may be more difficult to cope with than is generally accepted.

Although within this study, individuals with IBS and cancer experienced similar levels of distress, it likely stems from different underlying sources. Cancer patients can experience high levels of anxiety and depression associated with diagnosis and treatment [14]. IBS related distress, other than psychological arousal to physical sensations, is less well explained. As a functional bowel disease with no known physical cause, those with IBS symptoms may experience more social stigmatization than those with an organically verifiable disease such as cancer, although this hypothesis has not yet been fully investigated. Qualitative evidence revealed that individuals diagnosed with IBS feel stigmatized by family and friends, as well as within the healthcare system and workplace [31]. IBS sufferers reported experiences where others' lacked knowledge about IBS, did not take IBS symptoms seriously, and believed that symptoms were self-inflicted and/or imagined [31]. In general, however, there is a paucity of research regarding social stigma and IBS. Investigating associations among IBS symptoms, social stigma, and psychosocial distress may provide further explanation regarding high levels of distress in IBS sufferers.

The cancer and IBS groups both benefited similarly from the MBSR intervention over time. However, those with IBS showed something of a rebound effect on stress symptoms over the 6-month follow-up that was not seen in the cancer population. Potential reasons for this differential effect should be explored in future research. Since practice data was not collected over the follow-up period, it is possible that they practiced less meditation and yoga, but other mechanisms may also be at play.

Overall, these results support both the existing extensive research regarding the benefits of MBSR in cancer populations, and the recently emerging evidence that MBSR may be beneficial in reducing IBS symptom severity. Given that IBS symptoms are closely tied to cognitive and emotional arousal, reducing stress and enhancing positive mood states through a mind-body intervention such as MBSR may break the cycle of psychological arousal and physiological symptoms experienced by such individuals. Individuals with IBS symptoms, and those who provide treatment to these patients, may benefit from future studies that examine the exact mechanisms of action (e.g., enhanced mindfulness, education, group support) behind the beneficial impact of MBSR participation for this population.

There are components of this study that may limit the strength and applicability of these results. The cancer group was significantly older than the IBS group. The age of the cancer group may impact distress levels given that distress associated with cancer tends to decrease with age [14]. As well, the CSOSI has not yet been validated in an IBS population, although it is unlikely that CSOSI items would be less or more sensitive to individuals with IBS symptoms compared to those with cancer. Furthermore, change in mindfulness and time spent in home practice were not assessed in this study, and measures of mood and stress symptoms were based on self-report. Finally, it is possible that persons with IBS who chose to participate in an intensive MBSR program were actively seeking distress reduction due to experiencing particularly high levels of distress. A randomized controlled investigation of individuals with IBS blinded to the research question could clarify whether those with IBS symptoms generally have high levels of psychosocial distress, or if the effect reported in this study is related to highly distressed individuals specifically seeking distress reduction treatment.

In summary, prior to intervention individuals with IBS symptoms may be as, and in some domains more, distressed as individuals with cancer, suggesting a high need for psychosocial interventions in this population. This investigation calls attention to the distress associated with IBS and suggests that health care providers may benefit from investigating means to intervene and help individuals diagnosed with IBS relieve distress. MBSR as a psychosocial intervention for treating IBS is a promising option given that participants showed significant improvements in mood and reductions in stress after participating in the 8-week program, with mood improvement maintained at

least 6-months post intervention. Participation in a MBSR program may interrupt the cyclical pattern of the brain-gut activation and increased reactivity associated with exacerbation of IBS symptoms, and provides an alternative treatment approach to the high levels of distress in this patient population.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflict of interest to disclose.

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