




## Changes in psychosocial well-being after mindfulness-based stress reduction: a prospective cohort study

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### ABSTRACT

**Objectives:** The primary purpose of the current study was to assess the effects of a mindfulness-based stress reduction (MBSR) program, facilitated by non-psychologist clinicians, for improving psychosocial well-being. A secondary purpose of the current study was to explore the role of self-compassion as a potential underlying factor for improvements in emotional distress. Application of these findings to a physical therapy setting is provided.

**Methods:** One hundred and thirty participants with a variety of medical complaints completed an eight-week MBSR program at Vanderbilt University's Osher Center for Integrative Medicine. Prior to the intervention and at the eight-week time point, participants completed measures for emotional distress (Brief Symptom Inventory), stress (Perceived Stress Scale-10), mindfulness (Mindfulness Attention and Awareness Scale), and self-compassion (Self-Compassion Scale). Wilcoxon signed-rank test was used to evaluate changes in outcomes after MBSR. Linear model estimation using ordinary least squares was used to evaluate the association between changes in self-compassion with changes in emotional distress.

**Results:** Following MBSR, participants reported significant reductions in emotional distress ( $p < 0.001$ ). Additionally, participants reported improvements in mindfulness and self-compassion ( $p < 0.001$ ). Linear regression model revealed that changes in self-compassion were significantly associated with changes in emotional distress ( $p < 0.001$ ).

**Discussion:** An MBSR program conducted by non-psychologist clinicians was associated with improvements in emotional distress, stress, and self-compassion. MBSR is a promising adjunct intervention in which principles can be integrated within a physical therapy approach for chronic conditions.

**Level of Evidence:** 3B

### KEYWORDS

Mindfulness; health promotion; chronic pain; complementary therapies; physical therapy specialty

## Introduction

Chronic pain is a significant public health burden that is associated with poor surgical and rehabilitation outcomes, decreased well-being, and nearly \$80 billion annually in lost worker productivity [1,2]. Research shows a consistent relationship between life stress, stress management skills, and the development, preservation, and exacerbation of chronic pain [2–4]. Stress occurs when one's coping capability is exceeded by environmental, psychological, physiological, and biological demands [5]. Prolonged psychosocial stressors can modulate immune functioning and cause chronic inflammation and high glucose levels [6,7]. These biological alterations have implications for various co-occurring disease processes including obesity, diabetes, cancer, reproductive disorders, and cardiorespiratory conditions, which often exacerbate and/or maintain chronic pain [6,8]. Moreover,

poor stress and illness management results in low treatment adherence, higher hospitalization rates, pain flare-ups, and low levels of self-efficacy [2], which can impact a patient's ability to engage in the rehabilitation process.

Physical therapists encounter a variety of patients with chronic pain. Traditional physical therapy for chronic pain has largely focused on addressing physical impairments, improving movement, and reducing pain through the use of peripherally focused interventions including manual therapy and physical modalities [9,10]. Recently, there has been an evolving paradigm shift in physical therapy for chronic pain toward a psychologically informed approach [10]. Paramount to this approach is the recognition that psychosocial factors such as stress, anxiety, and depression can impact a patient's coping and/or recovery [11]. Anger related to grief, loss, and acceptance issues, which accompany living life with

chronic pain, commonly interferes with therapeutic rapport and rehabilitation [12]. There is also evidence that some patients with chronic pain experience physical manifestations of emotions to a larger degree, focus on somatic symptoms to distract from emotional pain, and exaggerate the importance of various bodily symptoms (i.e. numbness and pain) [2]; all of which amplify pain presentation and mood disturbances and decrease functionality and quality of life.

Physical therapists are often aware that stress, anxiety, depression, hostility, and somatization interfere with the rehabilitation process, but lack training to address these issues due to suboptimal mental health education, financial limitations for training, and scope of practice concerns surrounding psychologically based interventions [13–15]. Ideally, chronic pain is best managed and treated utilizing a multidisciplinary treatment approach [16]; incorporating physical therapy, psychotherapy, pharmacotherapy, and medical interventions as needed for the management of potential underlying conditions (e.g. diabetes, osteoarthritis, and Multiple Sclerosis) [2]. However, due to the stigma surrounding chronic pain and mental health issues, financial and insurance limitations, and time constraints, patients may not follow through with chronic pain guidelines that include engaging in psychotherapy within a multidisciplinary approach. Strategies and interventions that physical therapists can employ are needed to decrease the coexisting emotional, behavioral, and cognitive factors that exacerbate and/or maintain the physical aspects of a chronic pain condition and derail treatment adherence.

In the case where patients are unable and/or unwilling to engage in a formal behavioral medicine course of pain management, physical therapists can incorporate strategies such as mindfulness-based stress reduction (MBSR) as an adjunct intervention to the rehabilitation process [17]. MBSR is a complementary medicine intervention developed by Dr. Jon Kabat-Zinn that can be administered by any trained professional including physical therapists for helping patients manage chronic conditions. MBSR is influenced by Buddhist meditative traditions that emphasize intentional self-regulation of attention from moment-to-moment, attention restricting practices (e.g. breath work), and non-judgmental observation of sensory, affective, and cognitive experiences [18–21]. MBSR skills are easy to learn and administer, financially accessible, and can be integrated into most treatment plans. Moreover, MBSR is an intervention that is within a physical therapist's scope of practice, with clinical training programs requiring approximately 20 h of continuing education.

MBSR- and other mindfulness-based therapies have shown promise in attenuating stress and improving psychosocial well-being across a variety of medical populations including chronic pain and cardiopulmonary

conditions [22,23]. There is relatively good support for MBSR reducing stress, depressive and anxious symptomatology, and pain presentation [19,24–29]. Emerging evidence suggests that the clinical benefits following MBSR are related to improvements in self-compassion [30], which is a relevant therapeutic target for patients with chronic pain [31–33]. Nevertheless, the potential mediator(s) of MBSR outcomes require further clarification [34]; especially amid non-student and non-psychiatric samples. There is a continued need for determining MBSR treatment effects with larger sample sizes, assessing MBSR's ability to reduce hostility and improve self-compassion; given anger can interfere with physical therapy treatment gains [12], and discerning the aspects of MBSR that account for treatment outcomes.

The primary purpose of the current study was to describe outcomes associated with an MBSR program, facilitated by non-psychological clinicians, for improving psychosocial well-being. Previous research suggests participation in daily mindfulness practices fosters the development and ability to cope with mental and physical health issues [19,24–29]. Our study aimed to replicate these findings, in hopes of bolstering past research with a sample representative of the physical therapy population and a program administered with non-psychologist personnel. A secondary purpose of the current study was to explore the role of self-compassion as a potential underlying factor for improvements in emotional distress.

## Methods

### *Study design and participants*

This was a prospective cohort study with pre and immediate post-intervention follow-up at 8 weeks. Participants with a variety of medical complaints (e.g. chronic pain, trauma, depression, anxiety, and somatization disorders) were recruited through referral and advertisement from the campus of Vanderbilt University Medical Center (VUMC), the Osher Center for Integrative Medicine, and the surrounding community from August 2013 to October 2015. The majority of patients were referred from VUMC's Osher Center for Integrative Medicine that provides interdisciplinary care for patients with chronic pain/illness, comorbid adjustment, and/or psychiatric issues. Prior to enrollment, all participants were screened by a Registered Nurse or Health Psychologist for goodness of fit into the MBSR program and excluded for symptoms related to (1) active substance dependence issues; (2) inability to sit, stand, or lie down for 2.5 h weekly; and (3) suicidal or homicidal ideation, psychosis, and/or mania within the past year. Determination of a participant's appropriateness for MBSR is a standard practice during the pre-treatment orientation session [35].

## Procedures

Written informed consent was obtained by participants during the initial study session. At treatment intake and discharge, participants completed a standardized demographic questionnaire (age, sex, marital status, and smoking status) and validated measures including the Brief Symptom Inventory (BSI), Perceived Stress Scale (PSS-10), Mindfulness Attention Awareness Scale (MAAS), and the Self-Compassion Scale (SCS). After consent and completion of intake questionnaires, participants were enrolled in an eight-week, group MBSR program. Outcome measures were obtained after completion of the final session of the MBSR program. Ethical approval for study procedures was obtained from the Vanderbilt University Institutional Review Board.

## Primary outcomes

### Emotional distress

The BSI is a 53-item self-report questionnaire that measures psychopathological elements and stressors captured over the past week on a five-point Likert scale with 0 meaning 'not at all' and four meaning 'extremely' [36]. The BSI includes a Global Severity Index and nine subscales of symptom groups including somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. For the purpose of this study, only the Global Severity Index and depression, anxiety, somatization, and hostility subscales were used. Scores for the Global Severity Index and subscales are obtained by taking an average of all or individual scale items, respectively. Higher scores are indicative of greater psychopathology, and clinically elevated scores have diagnostic reliability in regard to diagnosing depression, anxiety, psychotic, and somatization disorders [37]. The BSI has shown to be reliable and valid in medical and psychiatric populations [36–38].

### Stress

The PSS-10 is a 10-item questionnaire used for evaluating the perception of life's events as uncontrollable, unpredictable, and overloading [39,40]. Responses on the PSS-10 range on a scale of 0–4 with 0 meaning 'never' and 4 meaning 'very often.' The PSS-10 score is calculated by summing individual items. Items 4, 5, 7, and 8 of the PSS-10 are reverse scored. Higher scores are indicative that an individual is negatively impacted by stressors. The psychometric properties of the PSS-10 have demonstrated good reliability and validity [41].

### Mindfulness

The MAAS is a 15-item questionnaire assessing present moment attention and receptive awareness [42]. Each item is scored on a Likert scale with one meaning 'almost always' and six meaning 'almost never.' The MAAS is

scored as an average of all items; with higher scores representative of better present moment awareness of affective, cognitive, sensory, environmental, task-oriented, and movement-related experiences. The MAAS is a valid and reliable measure in community-based and clinical samples [42,43].

## Predictor variable

### Self-compassion

The SCS is a 26-item scale based on Neff's theoretical model [44], which measures six dimensions of self-compassion: self-kindness, self-judgment, common humanity, isolation, mindfulness, and over-identification. Responses on the SCS are rated on five-point Likert-type (1 = 'almost never') to (5 = 'almost always'). An average score for all items (e.g. self-compassion) and the six dimension subscales are obtained. Reverse scoring is required on the isolation, self-judgment, and over-identification subscales. Higher scores on the total score are indicative of having more self-compassion. Higher scores for reverse scored subscales are indicative of decreased self-judgment, feelings of isolation, and over-identification with thoughts and feelings. Higher scores for the remaining subscales are indicative of increased self-kindness, common humanity, and mindfulness skills. The reliability and validity of the SCS have been demonstrated in previous studies [44–46].

### Mindfulness-based stress reduction intervention

This study incorporated an eight-week MBSR program based on Kabat-Zinn's University of Massachusetts protocol (Table 1) [47]. The goal of the MBSR program is to enhance mindfulness meditation skills through regular utilization of informal (e.g. mindful walking, mindful eating), formal (e.g. sitting meditation, body scan), and movement practices (e.g. yoga) to enhance physical and emotional wellness, reduce stress and affective avoidance behaviors, and improve tolerance for physical and emotional pain, which are all active coping skills likely to enhance the rehabilitation process. The goal of MBSR is to improve physical and mental health through enhancing one's present moment awareness, attention regulation practices, and non-judgmental observation of sensory, emotional, cognitive, and environmental experiences – cultivating a flexible attentional capacity to enhance coping and reduce distress [48]. Research suggests MBSR is a useful intervention for a broad range of health conditions; with mindfulness training enhancing coping skills and reducing distress and disability, which results in improved emotional health, physical well-being, and functionality [49]. Participants attended a weekly 2.5 h session over the course of 8 weeks and were provided with a mindfulness workbook available through the University of Massachusetts' online program. In

**Table 1.** Summary of the 8-week Mindfulness-Based Stress Reduction intervention [47].

Goals emphasized	Key session components	N/A	Practice and activity examples
Orientation	<ul style="list-style-type: none"> <li>• Introduction to class</li> </ul>	<ul style="list-style-type: none"> <li>• Education on MBSR and practice commitment of 45 min daily.</li> </ul>	N/A
Session 1	<ul style="list-style-type: none"> <li>• Introduction to MBSR</li> <li>• Establishing learning contract</li> </ul>	<ul style="list-style-type: none"> <li>• Review theory of mind-body medicine</li> <li>• Introduction to self-regulation and how this can impact the body and health</li> </ul>	<p>Enhancing attention to physical sensations through guided body scan, abdominal breathing, practicing mindful attention to eating</p>
Session 2	<ul style="list-style-type: none"> <li>• Deepening MBSR practice</li> <li>• Learning the role of perception in stress reactions</li> </ul>	<ul style="list-style-type: none"> <li>• Practice mindfulness awareness of thoughts, feelings, and sensations</li> <li>• Understand connection between thoughts and stress reactions</li> <li>• Emphasize personal ability to change this through altering reactions to stress through mindfulness</li> </ul>	<p>Guided meditations in class, guided standing yoga, sitting meditations, and learning the awareness of breath meditation</p>
Session 3	<ul style="list-style-type: none"> <li>• Introduction to formal MBSR practices</li> <li>• Increased awareness of body through formal practices</li> </ul>	<ul style="list-style-type: none"> <li>• Expand mindfulness practice with guidance from instructors</li> <li>• In-session formal practices (90 min): yoga, sitting meditation, walking meditation</li> <li>• Discussion of practice, challenges and insights</li> </ul>	<p>Identifying pleasant moments in session, practicing formal (e.g. body scan, yoga, sitting meditation) and informal mindfulness (e.g. awareness of self during everyday activities)</p>
Session 4	<ul style="list-style-type: none"> <li>• Deepening engagement in formal mindfulness practice</li> <li>• Development of concentration</li> <li>• Expanding awareness</li> <li>• Recognizing conditioned behavior</li> </ul>	<ul style="list-style-type: none"> <li>• Review the physiological and psychological basis of stress reactivity</li> <li>• Recognizing 'reactivity' and enhancing 'response'</li> <li>• Applications of mindfulness to improve stress responding</li> </ul>	<p>Extended sitting meditation, body scans, lying down yoga, tracking thoughts-feelings-behaviors when reacting to stress, educational readings on stress response, group discussion of concepts</p>
Session 5	<ul style="list-style-type: none"> <li>• Emphasize our own capacity to adapt more effectively to everyday stress and challenges</li> <li>• Further developing coping capacities for stress</li> <li>• To use expanded awareness to interrupt habitual patterns of stress reactivity</li> </ul>	<ul style="list-style-type: none"> <li>• Guided reflection into the 'half way' mark of class, growth, challenges, etc.</li> <li>• Discussion of observation and application of mindfulness in everyday life</li> <li>• Education of conditioned stress reactivity and the fight/flight response</li> <li>• Distinguishing facts from the interpretation of experience through mindfulness</li> </ul>	<p>Continued formal and informal practices, adding in awareness of difficult communication and expanded mindfulness practices</p>
Session 6	<ul style="list-style-type: none"> <li>• Application of MBSR skills in relationships and communication</li> <li>• Stressful communications</li> </ul>	<ul style="list-style-type: none"> <li>• Practicing remaining mindful in communication when stress arises</li> <li>• Bringing awareness to relationship patterns and their connection to internal states</li> </ul>	<p>Continue formal and informal practice</p>
Session 7	<ul style="list-style-type: none"> <li>• Maintaining discipline and flexibility in MBSR practice</li> <li>• Integrating mindfulness into daily life</li> <li>• Examining and challenging lifestyle choices</li> </ul>	<ul style="list-style-type: none"> <li>• Communication exercises in-session</li> <li>• Perspective-shifting exercises</li> <li>• Building flexibility through choice - individualized yoga practices and self-guided meditations during class</li> <li>• Identification of lifestyle patterns that are nourishing and those that are destructive</li> </ul>	<p>Continue practices but do not use recordings, instead do self-guided practice</p>
Session 8	<ul style="list-style-type: none"> <li>• Keeping practices as a way of life</li> <li>• Reflecting upon course</li> <li>• All questions answered</li> </ul>	<ul style="list-style-type: none"> <li>• Guided reflection through topics of course</li> <li>• Setting short-term and long-term goals for meditation practice in the future</li> <li>• Group dialogue on practicing independently</li> </ul>	<p>Formal practices in session, completing post-assessment paperwork, in-class meditation, reviewing home practices</p>

Abbreviations: MBSR = Mindfulness-based Stress Reduction.



addition to the eight-week MBSR program, participants were encouraged to attend an 8-h retreat to enhance their connection with self, others, the practice of mindfulness meditation, and the environment. Three non-psychologist clinicians including a registered nurse, licensed mental health social worker, and a certified yoga/mindfulness instructor facilitated the MBSR group sessions. All the facilitators underwent an intensive 8-week MBSR training and certification process through the University of Massachusetts Center for Mindfulness. Prior to certification completion, facilitators had more than 5 years of mindfulness meditation teaching and practicing experience.

### Data analysis

Descriptive statistics were presented as median (interquartile range) and mean (SD) for patient demographics and outcome variables. Wilcoxon signed-rank test was used to evaluate changes in the BSI (Global Severity Index and subscales), PSS-10, MAAS, and the SCS (Self-compassion and subscales). Absolute effect sizes ( $r$ ) was generated and interpreted using Cohen's criteria for small (0.3 or less), medium (0.3–0.5), and large (0.5 or greater) change [50]. Linear regression model using ordinary least squares was used to evaluate the association between changes in self-compassion and subscales with

changes in emotional distress from pre-test to post-test as measured by the Global Severity Index of the BSI. A measure of adequacy ( $A$ ) was computed to determine the proportion of log likelihood explained by the individual subset of predictor variables with reference to the entire set. Alpha was set to 0.05 level for statistical significance. Analyses were conducted using R statistical software [51].

## Results

### Participants

A total of 196 participants attended an orientation session for the study and agreed to participate. Of these, 130 participants (66%) attended all MBSR sessions and completed pre and post-treatment data. Demographic information for the 130 participants is included in Table 2. The attrition rate (34%) was due to potential participants not registering for the MBSR program, dropping out of the program, or not attending the final session to complete posttest information. The attrition rate in this study was consistent with acceptable group therapy attrition rates [52].

### Outcomes associated with mindfulness-based stress reduction

Analyses revealed participants scores at post-test were significantly improved across all variables (Table 3). Scores on the Global Severity Index of the BSI were significantly lower at post-intervention ( $W = 6290.0$ ,  $r = 0.40$ ,  $p < .001$ ). Subscales on the BSI for depression ( $W = 3504.5$ ,  $r = 0.33$ ,  $p < .001$ ), anxiety ( $W = 4222.5$ ,  $r = 0.40$ ,  $p < .001$ ), hostility ( $W = 2847.0$ ,  $r = 0.23$ ,  $p < .001$ ), and somatization ( $W = 2031.5$ ,  $r = 0.23$ ,  $p < .001$ ) and the PSS-10 ( $W = 5126.5$ ,  $r = 0.23$ ,  $p < .001$ ) were also significantly lower at post-intervention. Significant increases at post-intervention were noted in the MAAS ( $W = 697.5$ ,  $r = 0.50$ ,  $p < .001$ ), SCS ( $W = 706.5$ ,  $r = 0.50$ ,  $p < .001$ ), and

**Table 2.** Participant demographics.

Demographic variable	Value
Age, $N$ (%) in years	
18–24	0 (0.0)
25–29	6 (4.6)
30–39	30 (23.1)
40–49	33 (25.4)
50–59	23 (17.7)
60–69	25 (19.2)
70 and above	10 (7.7)
Sex, $N$ (%) Female	95 (73.1)
Marital Status, $N$ (%) Married	90 (69.2)
Smoking Status, $N$ (%) Yes	3 (2.3)

**Table 3.** Pre and post-intervention values for the BSI, PSS-10, SCS, and MAAS.

Measure	Pre-intervention				Post-intervention				ES*	$p^*$
	Median	IQR	Mean	SD	Median	IQR	Mean	SD		
BSI Global Severity Index	0.4	0.7	0.6	0.6	0.2	0.4	0.4	0.4	0.4	<.001
BSI somatization	0.1	0.6	0.3	0.5	0.0	0.3	0.2	0.3	0.2	<.001
BSI depression	0.3	1.2	0.8	1.0	0.2	0.5	0.4	0.7	0.3	<.001
BSI anxiety	0.7	1.0	0.8	0.9	0.2	0.5	0.4	0.6	0.4	<.001
BSI hostility	0.2	0.6	0.5	0.6	0.2	0.4	0.3	0.5	0.2	<.001
PSS-10	22.0	5.0	22.6	3.6	21.0	3.0	21.3	3.0	0.2	<.001
SCS total	3.0	1.2	3.0	0.8	3.5	1.0	3.5	0.7	0.5	<.001
SCS self-kindness	3.0	1.2	2.9	0.9	3.4	1.0	3.4	0.8	0.4	<.001
SCS common humanity	3.0	1.6	3.0	0.9	3.2	1.2	3.4	0.9	0.4	<.001
SCS mindfulness	3.2	1.3	3.2	0.9	3.8	1.2	3.7	0.8	0.4	<.001
SCS self-judgment	2.8	1.4	2.8	1.0	3.4	1.4	3.4	0.9	0.4	<.001
SCS isolation	3.0	1.8	3.0	1.1	3.5	1.6	3.5	1.1	0.4	<.001
SCS over-identification	2.8	1.5	2.8	1.1	3.2	1.2	3.4	0.9	0.4	<.001
MAAS	3.4	1.2	3.4	0.9	4.2	1.0	4.2	0.8	0.5	<.001

Abbreviations: BSI = Brief Symptoms Inventory; IQR = interquartile range; MAAS = Mindfulness Attention Awareness Scale; PSS-10 = Perceived Stress Scale; SCS = Self-Compassion Scale; SD = standard deviation.

\* $p$ -value and effect size (absolute  $r$ -values) are based on Wilcoxin Signed Rank test.

subscales of the SCS (range of  $W = 637.5$ – $1163.0$ , range of  $r = 0.36$  to  $0.44$ ,  $p < 0.001$ ).

### **Relationship between self-compassion and emotional distress**

Separate linear models were fit to assess the association between each SCS subscales change and the BSI global severity index change adjusting the baseline BSI global severity index. The results revealed that SCS total scores were associated with the Global Severity Index of the BSI ( $A = 0.92$ ,  $p < 0.001$ ). Subscales of common humanity ( $A = 0.81$ ,  $p < 0.001$ ), self-judgment ( $A = 0.89$ ,  $p < 0.001$ ), isolation ( $A = 0.83$ ,  $p < 0.001$ ), and over-identification ( $A = 0.80$ ,  $p < 0.001$ ) showed good predictive value. Self-kindness ( $A = 0.75$ ) and mindfulness ( $A = 0.73$ ) were less predictive of the Global Severity Index compared to other subscales.

### **Discussion**

The current study supports an association between an eight-week program of MBSR and significant reductions in emotional distress (depression, anxiety, somatization, and hostility) and stress, which are symptoms that often exacerbate chronic pain and can affect treatment gains, and improvements in mindfulness. Additionally, self-compassion was shown to be a key factor associated with improvements in emotional distress. These changes occurred with an MBSR program facilitated by non-psychologist personnel who underwent additional training. This evidence suggests that mindfulness could be used by physical therapists to augment physical rehabilitation by addressing co-occurring emotional distress.

Consistent with previous literature, mindfulness skills can be enhanced with MBSR [19]. Additionally, in line with the current study, mindfulness-based therapies have shown promise in attenuating stress and improving psychosocial well-being across non-clinical and medical populations such as cardiac, pulmonary, and chronic pain patients [24–29]. Effect size comparisons between the current study and previous MBSR studies show similar small-to-moderate effects, with larger relative effects observed in psychosocial constructs such as anxiety and depression and smaller relative effects in somatization [22], with findings surrounding reductions in somatic symptoms consistent with the literature [27]. Although the effect size for reducing somatization symptoms was not as great as the reduction in depressive and anxious symptomatology, this reduction demonstrates promise as somatic symptomatology is notoriously resistant to treatment [53,54]. The current study included a mixed population, which represented a participant sample who would realistically seek MBSR as a therapeutic modality for a clinical condition or for improved well-being. It is possible that a more homogenous group of participants would demonstrate larger effect sizes.

Regular utilization of mindfulness skills has been shown in prior studies to be related to improved quality of life, overall wellness, and decreased physical and mental health issues [19,22,26,55]. In the current study, a clinical measure of physical function or health was not included and is a limitation of the study. Future studies within a physical therapy setting should examine MBSR effects on improving psychosocial well-being, functionality, and reducing pain sensitivity and avoidance behaviors, as these are common referral issues. Despite the lack of data in the current study, clinical improvements in pain and functionality have been shown following mindfulness-based interventions [26,56]. Harvard researchers conducted a controlled observational cohort study appraising the benefits of integrating a Relaxation Response Resiliency program that closely resembles the current study's MBSR program into a patient's (e.g. chronic pain, diabetes, cardiopulmonary, liver or renal disease, and cancer) treatment regimen. Findings revealed that total healthcare utilization for the intervention group decreased by 43%, clinical encounters by 41.9%, imaging by 50.3%, lab encounters by 43.5%, and procedures by 21.4%; with emergency department visits decreasing from 3.6–1.7 annually [23]. These findings suggest that integrating an eight-session stress reduction program can significantly reduce healthcare utilization, enhance patient wellness, and reduce the financial burden on patients and the healthcare system. It is plausible that helping patient's learn stress reduction skills within a physical therapy setting can yield similar benefits.

### **Clinical application**

We have detailed suggested approaches for integrating mindfulness practices in physical therapy in Table 4. It is not uncommon for patients to experience strong emotional reactions when undergoing physical therapy [57]; such as when facing 'new' bodily limitation(s) resulting from illness progression or chronicity or after an injury [31–33]. Patients may have feelings of anger toward their affected region, which can exacerbate the pain presentation, interfere with development of body acceptance and pain tolerance, and impact motivation to engage in the rehabilitation process. Our study found MBSR's effect on self-compassion to be related to the changes in emotional and physical well-being. Given this, physical therapist should encourage a compassionate stance toward the body and healing process [31]. Additionally, helping patients develop a compassionate approach to their current situation may shift a patient's focus from cure-centeredness to embracing realistic goals, which can enable patients to embrace the experiential process of rehabilitation. Practically, this could be accomplished through drawing attention to physical sensations patients are experiencing and labeling them individually (i.e. non-judgmental awareness), identifying self-criticisms [33], acknowledging and labeling thoughts

**Table 4.** Mindfulness strategies for the physical therapist.

Strategy	Goal(s) of strategy	Physical therapy examples
Present Moment Awareness	Encourage participants to be aware of their sensory experiences with curiosity and non-judgment <i>What do you see?</i> <i>What do you hear?</i> <i>What do you feel?</i> <i>What do you taste?</i> <i>What do you smell?</i>	Encourage patients to be fully present for interventions such as manual therapy and other pain-relieving modalities by encouraging patients to either focus on their breath or the sensory experiences during the intervention (e.g. pressure, temperature)
	Discourage avoidance (e.g. painful part of body or negative emotional state) and/or amplification of experiences (e.g. magnifying negative thoughts)	Normalize the human tendency to worry about the future and/or ruminate about the past, while encouraging participants to redirect their attention on the present moment as often as needed. Teach the importance of having a mindful mindset in regard to healing, nervous system stabilization, and pain control
Attention Restricting Practices	Encourage participants to restrict their attention to a present moment experience such as the pattern of breath, how their feet feel as they hit the ground, and physical or emotional experiences	Encourage patients to focus on sensations of their body moving through a movement rather than pain and/or other unpleasant sensations and encourage attention switching as tolerated between unpleasant sensations (e.g. pain) and non-painful parts of the body, with the goal of enhancing patient's ability to be present with their pain without minimizing and/or amplifying it
Observation of Sensory, Affective, Environmental, and Cognitive Experiences	Encourage participants to engage in formal, informal, and movement practices with curiosity and without criticism or expectation  Encourage intention setting at the beginning of practice to include observation of sensory, affective, environmental, and cognitive experiences without criticism  Normalize the brain's tendency to get distracted by thoughts and other sensations and highlight the importance of awareness of these tendencies so patients can come back to practice (e.g. breathing, connection with movement) as soon and as often as possible.  Discourage emphasis of 'being free from thought or negative emotions' as goals	Inquire about patient's ability to engage in a moving activity mindfully (i.e. walking on treadmill, resistance exercise) by asking the following questions: <i>What thoughts were you having?</i> <i>How frequently were you lost in thought versus connected to your breath or movement?</i> <i>Did you believe your thoughts or feel the need to change and chase them?</i> <i>Did you have pleasant and/or unpleasant emotional experiences?</i> <i>Did you feel the need to move away from your emotions?</i> <i>Did you feel like your emotions amplified when you attended to them?</i> <i>Did you experience unpleasant physical sensations?</i> <i>Did you feel the need to ignore the physical sensations?</i> <i>Did you feel your physical sensations were dangerous or intolerable?</i> <i>Were you able to listen to the wisdom of your body?</i>

and emotions as they occur without attachment while focusing on the breath (present-moment attention), and/or adopting a gentle and kind approach to their suffering and recovery process (self-kindness).

Additionally, patients may feel a need to 'fix' the presenting problem quickly, 'push' too hard in treatment, or become frustrated with the physical therapist for setting limits. Patients may also experience pain or fatigue during exercises and become discouraged, anxious, hyper-focused on somatic symptoms, and/or dejected. Moments of struggle present another opportunity to cultivate self-compassion and overcome these potential barriers to treatment [58]. When circumstances are difficult, instead of attempting to fix or control a problem, physical therapist could utilize mindfulness skills to encourage patients to pause and offer oneself support and comfort – normalizing the process and remembering that such experiences are a part of being human.

### Limitations

There are several limitations in this study. The study included a mixed sample of participants, who were

mostly female, which may reflect current populations seeking MBSR options, but limits generalizability to specific medical settings such as outpatient physical therapy. Clinical data relevant to physical therapy such as functional limitations or pain were not collected in this study. The quasi-experimental design of the study does not allow for determination of cause and effect. Given these limitations, this study is best interpreted as proof of principle that an 8-week MBSR program can be facilitated by non-psychological personnel and yield improvements in psychosocial well-being. Translation of study findings within a physical therapy setting, with inclusion of physical therapy-specific samples, and using a more rigorous randomized study design is needed [17]. The attrition rate was high for an intervention study, but is normative for studies with group therapy [52]. Follow-up was limited to the immediate post-intervention period. Future studies will determine the latency of MBSR effects.

### Conclusions

An eight-week MBSR program conducted by non-psychologist clinicians was associated with improvements

in psychosocial well-being, including emotional distress, stress, and self-compassion. MBSR is a promising adjunct intervention that can be integrated within a physical therapy approach for chronic conditions.

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