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Theory of Planned Behavior and Mindfulness Intentions in Chronic Low Back Pain

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Abstract

Objectives Theory of planned of behavior (TPB) constructs have been linked to health behavior intentions. Intentions to try mindfulness-based stress reduction (MBSR), a first-line therapy for chronic low back pain (cLBP), have been less studied. This study aimed to identify which TPB constructs could inform strategies to improve adoption of MBSR.
Methods People with cLBP ($n = 457$) read a description of MBSR then completed survey items assessing TPB constructs: attitudes, norms, self-efficacy, perceived control, and intentions to try MBSR training.
Results Structural equation modeling showed self-efficacy/control (coefficient: 0.564), norms (0.245), and attitudes (0.131) were all positively associated with intentions to try mindfulness trainings.
Conclusions Results suggest self-efficacy/control may be the most strongly related TPB construct with intentions to try MBSR. Dissemination of MBSR for cLBP could focus on adapting the intervention to increase accessibility and improving available resources to overcome logistical barriers (online formats, drop-in classes).

Keywords Mindfulness · Theory of planned behavior · Dissemination · Intentions

Chronic low back pain is one of the leading causes of disability across the world (Vos et al., 2016). In the USA, chronic low back pain is highly prevalent with between 70 and 80% of American adults experiencing back pain at some point in their lives (Frymoyer, 1988). Of those with chronic low back pain, nearly 60% report at least moderate levels of pain and disability after a year (Costa et al., 2009). Chronic low back pain is also costly, with an estimated over $100 billion spent annually on medical costs plus indirect costs due to absenteeism and presenteeism (Ma et al., 2014).

Chronic low back pain is a particularly challenging medical condition to manage as the cause is frequently unknown (Croft et al., 2006), pharmacologic treatments may not be effective (Chou et al., 2017) and patients and medical providers become frustrated with the available treatments (Cherkin & Maccornack, 1989). The American Centers for Disease Control and Prevention (CDC) issued guidelines for prescribing opioids for patients with chronic non-cancer pain, including chronic low back pain, that noted non-pharmacological therapy be the preferred treatment for these patients (Dowell et al., 2016). In addition to the substantial harms associated with long-term opioid therapy (Carlson et al., 2016; Center for Behavioral Health Statistics & Quality, 2015; Cicero et al., 2014; National Institute on Drug Abuse, 2017), a recent systematic review concluded that "evidence is insufficient to determine the effectiveness of long-term opioid therapy for improving chronic pain and function" (Chou et al., 2015). The American College of Physicians published a clinical practice guideline (Qaseem et al., 2017) for low back pain that recommended 13 types of non-pharmacologic treatment, including mindfulness-based stress reduction (MBSR), as the first line of therapy for chronic low back pain. They reported that MBSR had moderate quality evidence as an effective treatment for chronic low back pain (Chou et al., 2017). Increasing access to non-pharmacological treatments of chronic low back pain, such as MBSR, is critical for reducing the costs and disability associated with this condition.

Mindfulness is defined as paying attention in a particular way, on purpose, in the present moment, and non-judgmentally. The practice of mindfulness meditation was adapted

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for medical patients as "Mindfulness Based Stress Reduction (MBSR)" by Jon Kabat-Zinn in the 1970s (Kabat-Zinn, 1990). The classic 8-week course included 28 h of classes and 31 h of home practice of three core techniques (i.e., body scan, mindful yoga, and sitting meditation), each designed to improve the patient's skill in the practice of mindfulness. While large trials of MBSR for chronic low back pain have slightly shortened the protocol (Cherkin et al., 2016; Morone et al., 2012, 2016), it is still a substantial commitment of time (e.g., over 22 class hours across 8 weeks). It is unclear how many patients would be willing or even able to put the time into the classic MBSR course. So, even though efficacy studies suggest benefits from this practice, the potential for widespread adoption of evidence-based MBSR programs for chronic low back pain remains an empirical question. Any delivery of MBSR would need to retain the core components of teaching participants to be present minded, focused on one thing and suspending judgment. Other aspects of MBSR such as the length of classes, the frequency of home practice, the modality (in-person, online), or the specific meditations (body scan, breathing, sitting, walking, sound) could easily be repackaged to promote greater adoption.

One way to better understand a patient's willingness to try MBSR is to use the theory of planned behavior (Ajzen, 1991), which postulates that three factors are directly related to behavior via intentions about the behavior. Attitudes are a person's own reaction towards a behavior, whether positive or negative. Subjective or perceived norms are a person's beliefs about others' attitudes. Self-efficacy and behavioral control are whether a person believes they can perform the behavior. Attitudes, subjective norms, and perceived behavioral control are hypothesized to influence intention to perform a specific behavior, which, in turn, influences the performance of the behavior. The theory of planned behavior has been used extensively for other health behaviors, including physical activity (Rhodes et al., 2019) and vaccination intentions (Shmueli, 2021). To date, this model has not been used to understand patients' willingness to try MBSR for chronic low back pain. Two studies have used the theory of planned behavior to predict mindfulness use in adolescents to young adults, finding that attitudes and self-efficacy can predict intentions (Crandall et al., 2019) and intentions and perceived norms can predict behavior (Beattie et al., 2019; Crandall et al., 2019). However, the model offers a valuable way to learn how to support patients in engaging with this evidence-based, non-pharmacologic care for chronic low back pain.

The purpose of the current study was to examine which theory of planned behavior constructs were associated with intentions to try MBSR for chronic low back pain. Different constructs would direct future research to identify different strategies for increasing the adoption of MBSR for chronic low back pain. Attitudes would indicate a need to identify beliefs and experiences affecting positive and negative attitudes towards mindfulness. Norms would suggest a need to identify which groups, such as community leaders and friend groups, could influence adoption and intentions to adopt MBSR. Self-efficacy and perceived control would indicate a need to assess which logistical, medical, and other barriers influence intentions through these constructs. To inform future dissemination and implementation studies, we asked people with chronic low back pain to read a description of MBSR and then answer questions assessing attitudes, norms, self-efficacy, control, and intentions.

Methods

Participants

Study participants were recruited through Kaiser Permanente Washington (KPWA), an integrated healthcare system serving over 600,000 people in Washington State, from December 2019 to July 2020. Eligibility criteria included age between 18 and 80 years old, meeting National Institute of Health Task Force definitions for chronic low back pain (persistent back pain for 3 months or more and pain on half the days or more in the past 6 months), received primary care through KPWA, and had a diagnosis of uncomplicated chronic low back pain in the past 12 months. Exclusion criteria were back pain due to identified medical illness (cancer, infection or inflammation, sciatica, fracture of the spine, pregnancy) and seeking compensation through the legal system for their back pain.

Demographic and back pain characteristics for the sample are reported in Table 1. Two-thirds of the sample were women, and the majority were White. Nearly 60% had a bachelor's degree or higher, and half the sample was currently working. Over 90% had chronic low back pain for a year or longer. Few (11%) participants had previously tried mindfulness. The vast majority (85%) of participants had tried exercise therapy such as physical therapy, and 43% had tried opioids for chronic low back pain. The level of sleep interference in the sample was comparable to the mean for the US adult population. Pain interference was higher than the population mean (63 vs. 50), and physical function was also lower than the population mean (34 vs. 50).

Procedures

Potentially eligible participants ($n = 10,495$) were identified through the electronic visit records at KPWA. Potential participants were mailed a study invitation letter that explained the study and provided a website link to a screening survey. If the

Table 1 Sample characteristics

Characteristic	N (%) or mean (SD)
Age group	
18–39	116 (25.4)
40–64	192 (42.0)
65 and older	147 (32.2)
Gender	
Male	142 (31.1)
Female	308 (67.4)
Race/ethnicity	
American Indian/Alaska Native	13 (2.8)
Asian American	28 (6.1)
Black or African American	18 (3.9)
Hispanic	17 (3.7)
Native Hawaiian or Pacific Islander	6 (1.3)
White	386 (84.5)
Education	
High school diploma, GED, or less	22 (4.8)
Some college	86 (18.8)
Associates or technical degree	76 (16.6)
Bachelor's degree	140 (30.6)
Master's degree	102 (22.3)
Doctoral degree	28 (6.1)
Currently working	230 (50.3)
Length of time having back pain	
3 months to 1 year	43 (9.4)
More than 1 year	413 (90.4)
Pain interference	63.22 (5.01)
Physical function	34.05 (4.77)
Sleep interference	54.05 (7.88)
Back pain treatments (ever tried)	
Opioids	196 (42.9)
Injections	115 (25.2)
Exercise therapy	389 (85.1)
Psychological counseling	42 (9.2)
Mindfulness	50 (10.9)
Yoga	199 (43.5)
Other mind–body therapies	110 (24.1)
Intention to try mindfulness (1–7 range)	4.86 (1.66)
Hours per week willing to learn mindfulness (0–12 range)	3.72 (2.57)
Attitudes items (1–7 range)	
Harmful-beneficial	5.75 (1.23)
Good-bad (reverse coded)	5.83 (1.37)
Worthless-useful	5.75 (1.29)
Necessary-unnecessary (reverse coded)	5.20 (1.37)
Norms items (1–7 range)	
People who are important to me want me to use mindfulness to manage my back pain	4.51 (1.60)
Most people who are important to me think that I should use mindfulness to manage my back pain	4.41 (1.59)
Self-efficacy items (1–7 range)	
I am confident that I can practice mindfulness at home	5.47 (1.45)
I am confident that I could participate in a mindfulness training program	5.32 (1.60)

Table 1 (continued)

Characteristic	N (%) or mean (SD)
I would be able to participate in mindfulness training if I really try	5.93 (1.32)
Controllability items (1–7 range)	
Whether or not I choose to use mindfulness is entirely up to me	6.66 (0.82)
The decision to use mindfulness is beyond my control	6.45 (1.14)
There are many things that would prevent me from participating in mindfulness training	4.76 (1.77)

For intentions, attitudes, norms, self-efficacy, and control, higher scores indicate more of the construct or more positive scores

SD standard deviation

person was interested, they went to the website and completed the six-item screening survey to ensure they were eligible for the study. People who were not eligible ($n=247$) were thanked for their time. People who were eligible were taken to the consent form where they would then read the form and provide informed consent. People who provided consent and agreed to take the survey were immediately able to begin online study participation. Participants read a detailed description of the classic MBSR (2 h per week, specific techniques, summary of scientific research showing that MBSR is effective for chronic low back pain, the need to practice at home). The description was drafted by the study team and reviewed by five people with chronic low back pain. The study team included a senior scientist who studies mindfulness treatments and two clinical psychologists, one of whom trained in mindfulness therapy and currently uses mindfulness therapy in clinical practice. The MBSR description was then revised by communications specialists to ensure it met plain language standards and had a 9th-grade reading level. After participants read the description of MBSR, they answered 26 questions about their intentions (3 items), preferred hours they could devote to MBSR training (1 item), attitudes (8 items), perceived norms (6 items), self-efficacy (3 items), and controllability (5 items) for participating in MBSR. Based on exploratory factor analyses and high correlations between items across constructs, we excluded 12 items from the main analyses (2 intention items, 4 attitudes items, 4 norms items, 2 controllability items). A total of 457 people completed the survey for a response rate of 4.4%. Study procedures were approved by the relevant institutional review boards, and all ethical standards were followed.

Measures

The questionnaire for this study was developed according to the theory of planned behavior manual (Francis et al., 2004). We convened three focus groups of people with chronic low back pain to gather their views about mindfulness training.

Focus groups covered participants' attitudes about mindfulness, how they perceived others thought about the technique and their perceived self-efficacy and controllability for completing mindfulness training. Following the focus groups, we created questions assessing intentions, attitudes, norms, self-efficacy, and controllability for participating in MBSR based on participants' own words. We also created a question asking how many hours per week participants would be willing to spend on mindfulness training. We then tested the readability and clarity of the questions in five cognitive interviews with people that had chronic low back pain. Questions were revised further based on cognitive interview results.

One survey item assessed intention to complete mindfulness training (hereafter referred to as intention), assuming it was available ("I plan to participate in mindfulness training"). Another item assessed hours per week (hereafter referred to as "hours") a person was willing to spend on mindfulness training ("How much time would you be willing to commit to mindfulness training instruction?"). The question and mindfulness description were worded to clarify that this meant the classes, not necessarily home practice. Four questions assessed personal attitudes towards mindfulness. Each attitude question was rated on a 7-point, bipolar scale using the following four scales: harmful-beneficial, good-bad, worthless-useful, and necessary-unnecessary. Two items assessed perceived norms, specifically whether people important to the respondent wanted them to use MBSR for back pain. Both norms items were rated on a 7-point Likert scale. Three items assessed self-efficacy (confidence in participating in mindfulness, participating if truly tried to do so). Three items assessed controllability to participate in mindfulness, specifically barriers to mindfulness participation and whether participation was within participants' control. Self-efficacy and controllability items were all rated on a 7-point Likert scale (strongly disagree to strongly agree). All negatively worded items were recoded so all item scores had a positive valence.

The survey included demographic and cLBP questions to describe the sample. Participants also completed measures on pain interference, physical function, and sleep disturbance from the Patient-Reported Outcomes Measurement Information System (PROMIS) (Reeve et al., 2007). PROMIS measures have been shown to be reliable and valid.

Data Analyses

To test the relationship between theory of planned behavior constructs and our two outcomes (intention, hours), we used structural equation modeling (SEM). SEM is a statistical technique that examines the correlations between manifest variables (i.e., items on a questionnaire), and models the relationship between latent, unobservable factors that can influence the relationships between measured survey items. Due to potential non-normality, we used polychoric correlations. Our primary outcome was *intention*, and our secondary outcome was *hours*, which were modeled separately. The theory of planned behavior constructs (attitudes, norms, self-efficacy/controllability) were our predictors of interest and were all modeled as latent variables with directional pathways to the intention item or the hours item. Based on modification indices and a preliminary exploratory factor analysis (see Supplemental Materials for results of factor analysis), we combined self-efficacy and controllability because they were highly correlated (0.95) and also because these are often combined in theoretical models (Ajzen, 1991). We also included a covariance of the error terms for two of the control items based on modification indices. All analyses controlled for age and gender. We tested other patient characteristics (back pain characteristics, previous treatments, depression, alcohol use, tobacco smoking, pain interference, physical function, sleep interference, education, and body mass index) for statistically significant bivariate associations with intentions and found no significant correlations. Only education was significantly associated with hours, and this was included as a covariate. We collapsed the hours variable into three ordinal categories: less than 2 h per week (below minimum dose for mindfulness training), 2 to 3.9 h per week (minimum mindfulness training dose), and 4 h or more per week (more than the minimum mindfulness training dose). Analyses were limited to participants who completed the relevant survey items.

Results

Values on the items used in the structural equation models are summarized in Table 1. *Intentions* were moderate, with a mean of 4.86 just above the mid-point of the response scale. Attitudes were fairly positive, with all means over 5 on the 1-to-7 scale. Perceived norms were slightly positive with means around 4.5 (1-to-7 scale). Means on self-efficacy and controllability were also above the mid-point of the 7-point scale. Participants appeared to use the entire 7-point scale as all points were used for all items except one of the attitude items (harmful-beneficial), in which the most negative category (harmful) was not endorsed by any participant.

Theory of Planned Behavior and Intentions

The structural equation model comparing theory of planned behavior constructs to intentions converged. The root mean square error of approximation (RMSEA) was 0.097 (95% confidence interval (CI): 0.088, 0.106). The comparative fit index (CFI) was 0.929, and the root mean square residual (RMSR) was 0.061. Fit indices were not ideal but were

close to standard guidelines (RMSEA ≤ 0.08, CFI ≥ 0.95, RMSR ≤ 0.05) (Hu & Bentler, 1999), and this is not surprising given that the measure was developed specifically for this study and not previously tested. The chi-square was 416.293 ($p < 0.001$). Results from the structural equation model comparing the theory of planned behavior concepts with intentions are reported in Fig. 1. All the paths from attitudes, norms, and self-efficacy/control to intentions were statistically significant ($p < 0.05$). The largest standardized coefficient (0.564) was from self-efficacy/control to intentions, suggesting that higher self-efficacy and perceived controllability to participate in mindfulness were associated with greater intentions to try MBSR. The standardized coefficient from perceived norms to intentions was 0.245, also indicating a positive relationship such that perceiving more positive evaluations of MBSR by others was associated with higher intentions. The weakest path was from attitudes to intentions (standardized coefficient of 0.131), indicating that more positive attitudes towards MBSR were associated with higher intentions.

Theory of Planned Behavior and Hours per Week

As with the intentions model, the model for hours per week converged and fit indices were acceptable considering that this questionnaire was developed specifically for this study and had not been tested previously. The RMSEA was 0.095 (95% CI: 0.087, 0.104), the CFI was 0.913, and the RMSR was 0.067. The chi-square was 473.265 ($p < 0.001$). Parameters between the theory of planned behavior constructs and the hours variables are reported in Fig. 1, and all paths were significant ($p < 0.05$). The paths between perceived norms and self-efficacy/control with hours were all positive, indicating that higher perceived norms, self-efficacy, and perceived control were associated with more hours. The largest standardized coefficient was between self-efficacy/controllability and hours (0.408), and the next largest was between norms and hours (0.235). Interestingly, the path between attitudes and the hours variable was negative. As the negative path between attitudes and hours may indicate a suppressor effect, we also report the bivariate correlations (Supplemental Material) and the correlations between the TPB constructs. Attitudes correlated with norms (0.610) and self-efficacy/control (0.674), and norms and self-efficacy/control correlated at 0.584.

Discussion

This study examined the relationship between attitudes, norms, self-efficacy, and control with intentions and hours to try mindfulness in chronic low back pain. Overall, participants had positive attitudes towards mindfulness training.

Results showed a strong relationship between the combined self-efficacy and controllability factor and intentions. Attitudes and norms both had a weak relationship with intentions. Self-efficacy and controllability had a strong relationship with hours one was willing to spend on mindfulness training. Norms had a weaker relationship with hours on mindfulness training. Attitudes had a negative relationship with hours on mindfulness training, but this was likely due to a suppressor effect given the positive bivariate correlations and moderate correlations between attitudes, norms, and self-efficacy/control. Results showed demographic and disease factors were unrelated to intentions and hours, suggesting tailoring MBSR to each individual patient and their level of self-efficacy may increase adoption. Given the personal- and societal-level burdens of cLBP, these results support attempts to increase the self-efficacy and perceived controllability to use mindfulness in this population. Increasing self-efficacy and perceived controllability for using mindfulness could help alleviate the suffering from cLBP if it then leads to an increase in the uptake of mindfulness. Overall, self-efficacy and perceived control had the strongest and most consistent relationship with variables associated with mindfulness participation.

An interesting finding was that self-efficacy and perceived control were consistently and strongly related to intentions to try mindfulness, but attitudes and norms were not. It is possible that attitudes and norms were so high, given the study was conducted in a region of the USA where mindfulness is well known, and that a ceiling effect tempered the association. However, the values did not reflect a ceiling effect on attitudes and norms that could explain this lack of association, although attitudes and perceived norms were overall positive. Unlike other self-management interventions for chronic low back pain, as described to participants in the study materials, MBSR demands a patient's full focus and concerted effort to learn. MBSR requires regular class attendance and home practice outside of the classes. Mindfulness is also not easy to learn and requires enough time investment to see any benefits. These unique characteristics of mindfulness and MBSR specifically may explain the weak association between attitudes and intention and also support the strong association of self-efficacy and controllability to intentions and hours. Whether a person feels they can meet the demands of MBSR could be the primary determinant of participation. For example, one of the controllability items was about the decision to try mindfulness being beyond the person's control; participants with lower intentions may have believed the demands were too great for them to meet. While it is possible that attitudes and norms have a threshold above which they no longer influence intentions, our results are most consistent with self-efficacy and perceived controllability being essential to intentions to adopt a mindfulness practice.
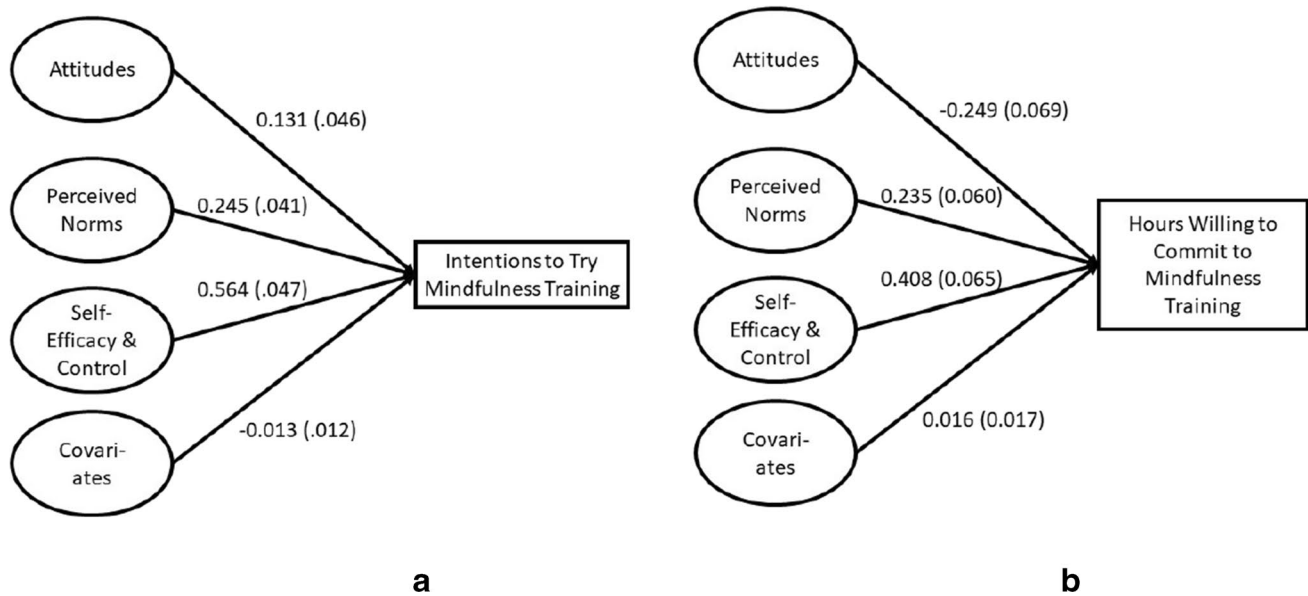
a

b

Fig. 1 Structural equation models with standardized coefficients and the standard error in parentheses. Measurement model, covariates, and errors are not shown for clarity. All models controlled for age and gender, and the hours model controlled for education. The intentions variable **a** asked whether participants planned to participate in mind-

fulness on a 7-point scale, with higher scores indicating more intention. The hours participants who were willing to spend on mindfulness training **b** were categorized into the following: less than 2 h, 2 to 3.9 h (standard mindfulness training dose), and 4 h or more

Our results could inform dissemination and implementation of MBSR for patients with chronic low back pain. The control items in particular suggest that external factors could affect self-efficacy and perceived control, and future studies are needed to identify these factors. Results also suggest that strategies to increase MBSR adoption among those with chronic low back pain could focus on increasing self-efficacy and controllability. Future research could examine whether addressing logistic barriers (childcare, offering classes in community settings where prospective participants may naturally convene, delivering classes at various times and using telehealth) could enhance one's self-efficacy and perceived control for engaging in mindfulness training. MBSR may be easier to pivot to telehealth than other chronic low back pain treatment such as yoga or physical therapy given less emphasis on physical movement. The COVID-19 pandemic has led to an explosion of telehealth (Koonin et al., 2020), and making MBSR training available through online platforms could increase self-efficacy and control. Another option could be adjusting the number of hours per class. A review suggested that the total number of hours may not be related to the psychological distress benefits of MBSR (Carmody & Baer, 2009), but whether this is also true for pain requires additional research. MBSR could also be adapted to provide more structured support or flexibility in specific meditation techniques for participants that perceive mindfulness meditation as challenging. Future research might examine

whether barriers around perceived mindfulness ability influence self-efficacy and control. The form or peripheral aspects of MBSR could then be adapted to different logistical and ability barriers to increase self-efficacy and ultimately adoption while maintaining the core components of training attention to be presently focused, on one thing, non-judgmentally.

The results of this study are consistent with investigations of barriers to MBSR in other populations. A qualitative study of veterans found scheduling difficulties, lack of time, and mobility issues were barriers to MBSR for mental health concerns (Martinez et al., 2015). Similar barriers of time demands were found in a study of healthcare personnel considering MBSR for stress management (Banerjee et al., 2017). These logistical barriers are consistent with our finding that self-efficacy and perceived control are most strongly associated with intentions to try MBSR as logistical barriers could decrease self-efficacy and perceived control. Overall, finding ways to deliver MBSR flexibly to fit participants' schedules, address access barriers, and address disability (difficulty concentrating or hearing, trouble walking) could greatly increase adoption.

Limitations and Future Research

This study had several limitations. First, the outcomes were hypothetical plans to try MBSR and hours willing to spend on MBSR. There is a documented gap between

intentions and behavior (Rhodes & de Bruijn, 2013), and it is possible that our results will not translate to actual participation in MBSR. Second, this study was cross-sectional so causality cannot be inferred. The survey was developed specifically for this study, meaning it reflected what was most important to those with chronic low back pain, but the reliability and validity of the measure is not certain. However, our use of focus groups and cognitive interviews is a potential strength of the measure. The sample was entirely from Washington State and predominantly White and well-educated so results might not be generalizable to other locations and populations. Washington State has a culture that is friendly to both scientific evidence and integrative medicine, and other locations without these characteristics might find lower intentions or a stronger effect of perceived norms. The response rate was also low, but this does not necessarily mean that the sample was biased (Groves, 2006). Because of the limitations of health record data for identifying cLBP, we cannot be certain whether everyone invited to participate was actually eligible and the low response rate could be due to ineligible people not responding. Our participants were also predominantly female, had at least a bachelor's degree, and were White. Part of this is due to the Kaiser membership, but it could also be due to women with cLBP being more open to integrative medicine treatments. The demographics of the sample could have increased their willingness to engage in mindfulness training. Despite the limitations, result can still inform future efforts to increase MBSR adoption.

This study supports continued efforts to adapt MBSR and increase accessibility of this evidence-based treatment for chronic low back pain. Dissemination strategies to increase adoption of MBSR might focus on telehealth, flexible scheduling, and other methods of improving access as these could increase self-efficacy and perceived control for people with chronic low back pain. Future research is needed to determine how MBSR can be adapted for accessibility while maintaining efficacy in chronic low back pain. Implementation efforts could capitalize on the increase in telehealth to deliver this evidence-based treatment to people with chronic low back pain.

Author Contribution SMWJ: study design, data analysis and interpretation, and manuscript draft. KJS: study conceptualization and design, data interpretation, and manuscript revisions. ZB: data collection and interpretation and manuscript revisions. LGP: study design, data interpretation, and manuscript revision. CCL: study conceptualization and design, data interpretation, and manuscript revision.

Declarations

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