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Mindfulness as a protective factor against depressive symptoms in people with fibromyalgia

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Abstract

Background—Depressive symptoms complicate pain management for people with FM, with adverse consequences such as a greater need for pain medications and limited pain coping strategies. Determining risks and protective factors associated with depressive symptoms in persons with FM could inform the development and implementation of mental health interventions.

Aims—To formulate and test a behavioral activation model of depression with mindfulness as a protective factor for people with FM.

Methods—We conducted an online cross-sectional survey with 117 adults with FM from community and clinic networks. Path analysis was used to assess the relationships of pain intensity, perceived stress, activity interference, pain catastrophizing and mindfulness with depressive symptoms.

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Declaration of interest

No potential conflict of interest was reported by the authors.

Results—Mindfulness has a negative direct association with depressive symptoms and a negative indirect association with depressive symptoms through perceived stress, activity interference and pain catastrophizing. Perceived stress, activity interference and pain catastrophizing had direct associations with depressive symptoms. Finally, perceived stress, activity interference and pain catastrophizing had indirect associations with depressive symptoms through pain intensity.

Conclusions—Mindfulness seems to play an important role as a protective factor against the negative effects of stress and depression among people with FM and should be included in mental health interventions for chronic pain.

Keywords

Depression; mindfulness; cognitive-behavioral theory; chronic pain; fibromyalgia

Fibromyalgia (FM) is a chronic disorder of unknown etiology defined by widespread musculoskeletal pain and low pain thresholds at specific sites throughout the body (Wolfe et al., 1995). FM affects approximately 2–8% of the population and more women than men by a ratio of 9:1 (McBeth & Jones, 2007). FM and other chronic pain conditions are among the leading causes of functional impairment (Choy et al., 2010), disproportionately high healthcare expenditures (Institute of Medicine, 2011), poorer health-related quality of life (Zettel-Watson et al., 2011), and work-related disability (Stewart et al., 2003). FM is further exacerbated by a greater vulnerability to the effects of stress, which can interfere with daily activities and overall health status (Murray et al., 2006).

Although pain is prominent in a FM diagnosis, secondary symptoms such as fatigue, sleep disturbances, other somatic complaints, cognitive dysfunction and psychiatric disorders have been added to proposed changes to the diagnostic criteria by the American College of Rheumatology (Wolfe et al., 2010). Clinical depression is one of the most common and debilitating secondary conditions in people with FM. Epidemiological evidence indicates the lifetime prevalence of depressive symptoms for persons with FM is as high as 90% and rates for major depression range from 62% to 86% (Aguglia et al., 2011; Marangell et al., 2011). An extensively studied symptom related to depression in people with chronic pain is catastrophizing (Arnow et al., 2011). People with chronic pain and depression often present with catastrophic thinking about pain or the “overappraisal” of the negative aspects of the actual or anticipated pain experience (Sullivan et al., 1995). Adverse consequences of depression and pain catastrophizing include greater consumption of pain medications, decreased positive affect, higher emotional dysregulation, limited use of adaptive pain-coping mechanisms, and higher frequency and intensity of suicidal ideation (Davis et al., 2001; Edwards et al., 2011; Gracely et al., 2012; Zautra et al., 2005).

Clinical depression complicates pain management for people with FM (Bair et al., 2008). Formulating and testing a behavioral activation model of depression in persons with FM would advance empirical knowledge and further inform the development and implementation of mental health interventions. The Integrative Model of Depression (IMD) can offer a practical approach to understanding the relationships between functional problems and depression-related factors in people with FM.

Behavioral activation model of depression

The IMD was developed by Lewinsohn et al. (1985) and provides a theoretical framework to guide exploration of the linkages among stressful life events, functional impairment, and the onset and maintenance of depression. The primary assumption is that stressful life events (e.g. onset of a chronic illness or disability like FM) interfere with everyday behaviors and activities. Activity interference coupled with immediate psychological distress may lead to unsatisfying experiences, reduced positive reinforcement, and a heightened state of self-focused attention. Self-focused attention intensifies one's negative appraisal of self in relationship to the evoking stressful life event, setting the context for a depressive episode (Lee et al., 2007). Another assumption of the model is that persons have predisposing vulnerabilities and protective factors that can affect the risk for depression. The depression treatment of Behavioral Activation evolved out of the IMD, emphasizing the significant link between mood and participation in pleasant activities (Lewinsohn, 1974).

The extant literature indicates mindfulness is a protective factor against the negative effects of psychological distress (Hayes & Feldman, 2004). Mindfulness involves a curious, open-minded awareness about experiences, even negative ones (e.g. pain intensity), leading to unconditional acceptance (e.g. adaptive pain coping). With this psychological flexibility, mindfulness helps people to inhibit negative affective responses and enhance consciousness of potential sources of positive reinforcement (Davis & Zautra, 2013). Emerging evidence shows that mindfulness-based interventions are effective for treating pain, depression, and other health problems in adults with FM and other chronic pain conditions (Grossman et al., 2004; Sephton et al., 2007; Song et al., 2014).

Study purpose

The main purpose of the current study is to test a modified version of Lewinsohn's model specific to people with FM (Figure 1). More specifically, the current study will examine whether mindfulness, pain intensity, perceived stress, activity interference and pain catastrophizing are directly and indirectly associated with depressive symptoms.

Methods

Participants

Participants in this study were a convenience sample of 117 adults who reported a diagnosis of FM from a larger sample of 211 participants with chronic musculoskeletal pain conditions. Criteria for selection included age of 18 years or older with a medical diagnosis of nonmalignant, chronic musculo-skeletal pain, having an experience of pain for longer than three months, and the ability to engage in some type of physical activity and exercise.

Upon receiving approval from the [blinded for review] Social and Behavioral Sciences Institutional Review Board (IRB), participants were recruited using newsletters, bulletins, and recruitment flyers from community and clinic networks, including Midwest churches, pain, physical therapy and primary care clinics, as well as national chronic pain and FM support groups. Prospective participants were invited to complete an online questionnaire on

SurveyMonkey. The questionnaire included the informed consent, demographic questions and standardized measurement tools. Participants were provided the option to receive a \$15 gift card after completing the survey. To maintain the confidentiality of participants, contact information was automatically transmitted to a separate file from the survey data.

Measures

The path model was composed of several measures. The measured variables included pain intensity, activity interference, perceived stress, mindfulness, pain catastrophizing and depression. Table 1 provides descriptive statistics for the measurements used in the current study.

Depressive symptoms—The *Patient Health Questionnaire-9* (PHQ-9; Kroenke et al., 2001) was used to measure depressive symptoms. Each item (e.g. “thoughts that you would be better off dead or of hurting yourself in some way”) is rated on a three-point scale ranging from 0 (not at all) to 3 (nearly every day) with higher scores representing more depressive symptoms. Spitzer et al. (1999) reported internal consistency reliability estimates of 0.89 for a PHQ primary care study and 0.86 in a PHQ Obstetrics-Gynecology sample.

Pain intensity—The *0–10 Numerical Rating Scale* (NRS; McCaffery & Beebe, 1993) was used to measure pain intensity. Respondents indicate their average pain intensity during the past week. Each item is rated on a 10-point rating scale ranging from 0 (no pain) to 10 (pain as bad as it could be). The discriminant validity of the NRS in measuring sensory rather than affective pain has been demonstrated in a sample of adults with chronic musculoskeletal pain (Huber et al., 2007).

Activity interference—The *World Health Organization Disability Assessment Schedule II* (WHO-DAS 2.0 item version) was used to measure activity interference. The WHO-DAS 2.0 assesses the impact of a chronic illness or disability in terms of functioning, which is based on the International Classification of Functioning, Disability and Health (WHO, 1998). This scale has 12 items and covers six domains of life activities: understanding and communicating with the world; moving and getting around; self-care; getting along with people; life activities; and participation in society. Each item (e.g. “how much have you been emotionally affected by your health problems?”) is rated using a five-point rating scale ranging from 0 (no difficulty) to 4 (extreme difficulty/cannot do) during the past 30 d. The WHO-DAS 2.0 was field-tested cross-culturally and reported to be useful in both clinical and non-clinical settings (Bindt et al., 2012; Von Korff et al., 2008).

Perceived stress—The *4-item Perceived Stress Scale* (PSS-4; Cohen & Williamson, 1988; Cohen et al., 1983) was used to measure perceived stress. It was developed to assess the degree to which life situations are perceived as stressful. Each item (e.g. “In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?”) is rated using a five-point scale ranging from 0 (never) to 4 (very often) with higher scores representing higher levels of perceived stress. Cohen et al. (1983) reported an internal consistency reliability estimate of 0.72 for the PSS-4 and test-retest reliability over a two-month period of 0.55.

Mindfulness—The *Cognitive and Affective Mindfulness Scale-Revised* (CAMS-R; Feldman et al., 2007) was used to measure everyday mindfulness with regard to thoughts and feelings. The CAMS-R is composed of 12 items including four subscales: attention (“I am easily distracted”), present focus (“I am able to focus on the present moment”), awareness (“I try to notice my thoughts without judging them”) and acceptance (“I am able to accept the thoughts and feelings I have”). Each item is rated using a four-point rating scale ranging from 1 (rarely/not at all) to 4 (almost always) with higher scores reflecting greater mindfulness. Internal consistency reliability estimate for the CAMS-R has been found to be 0.76 (Feldman & Hayes, 2005). There is also evidence for convergent and discriminant validity for the CAMS-R with concurrent measures of mindfulness, distress, well-being, emotion-regulation and problem-solving approaches in three samples of university students (Feldman et al., 2007).

Pain catastrophizing—The *Pain Catastrophizing Scale* (PCS; Sullivan et al., 1995) was used as a measure of pain catastrophizing. The PCS assesses the frequency of catastrophic thoughts related to pain. This scale is composed of 13 items and yields three different subscales of rumination, magnification and helplessness. Each item is rated on a five-point rating scale, ranging from 0 (not at all) to 4 (all the time). The internal consistency reliability estimate for PCS was found to be 0.87, and it has been found to be significantly associated with heightened pain, disability and employment status (Sullivan & Stanish, 2003).

Data analysis

The Statistical Package for the Social Sciences (SPSS, Version 22, SPSS Inc., Chicago, IL) was used to compute the descriptive statistics for all independent and dependent variables. Frequencies, percentages, means and standard deviations were used to summarize demographic characteristics of participants. Path analysis was used to estimate direct effects of pain intensity and both direct and indirect effects of mindfulness, perceived stress, activity interference and pain catastrophizing in the hypothesized model of depression. All model estimations were conducted with AMOS 18.0 using maximum-likelihood estimation (Arbuckle, 2007). The model-data fit was examined using the chi-square goodness-of-fit test as well as several alternative fit indices that is less affected by the sample size, including the χ^2/df , the comparative fit index (CFI), and the root mean square error of approximation (RMSEA). To evaluate the overall goodness-of-fit criteria for the path analysis, the χ^2 should not be significant, χ^2/df should be in the range of 1–3, the CFI should be equal to or greater than 0.95, and the RMSEA should be smaller than 0.08 (Byrne, 2001). If model modifications are necessary, the critical ratio will be examined to eliminate insignificant paths and modification indices from the Lagrange multiplier test will be considered for adding paths.

Results

Participants included 111 (94.9%) women and six (5.1%) men, with a mean age of 45.8 years of age ($SD = 12.81$, range = 22–80). Approximately, 68% were married or in a significant long-term relationship. Participants primarily identified as European American (91.5%) and most had completed at least some college (91.5%), with over half having

earned a bachelor's degree or higher (62.4%). Twenty-two percent of the sample reported being employed full-time, 19.7% part-time and 42.7% as retired or not seeking employment. The most frequently selected career category was "professional" (51.3%), followed by "service worker" (11.1%), and "student" (10.3%). The median household income for participants was \$45 000 ($M = \$52\,952$, $SD = \$55\,255$). Age of onset for chronic pain was 31.10 ($SD = 11.32$, range = 4–56).

The intercorrelations among the variables in the behavioral activation model of depression are presented in Table 2.

The relationships among the variables in the depression model were relatively high, and depression was significantly associated with all predictor variables (range: $r = -.42$, $p < 0.01$ to $r = .69$, $p < 0.01$). Mindfulness was significantly associated with perceived stress, activity interference, catastrophizing and depression (range: $r = -.30$, $p < 0.01$ to $r = -.46$, $p < 0.01$).

The results of the path analysis revealed a significant chi-square, $\chi^2(3, N = 117) = 13.84$, $p < 0.01$; $\chi^2/df = 4.61$; CFI = .98; and RMSEA = .13. The results indicated the model was less than adequate. We performed post hoc model modifications to determine whether a better fitting model could be developed. Based on empirical guidance and conceptual reasoning, two structural paths were found to have a critical ratio less than ± 1.96 ($p > 0.05$). This suggests that these paths could be eliminated from the model: (a) the association between pain intensity and depression and (b) the association between pain intensity and mindfulness. In addition, an examination of the MI values suggested no new paths are needed to add to the model. The respecified model of depression resulted in a non-significant chi-square value, $\chi^2(4, N = 117) = 6.90$, $p = 0.14$, indicating the model is a good fit for the data. An examination of alternative fit indices, $\chi^2/df = 1.73$; CFI = .99; and RMSEA = 0.059, also indicated the respecified model fits the data very well. The difference between the original model and the respecified model was significant, $\chi^2_{diff} = (1, N = 117) = 6.94$, $p < 0.01$. The R^2 values for the respecified model of depression ranged from 0.39 to 0.63. Specifically, pain intensity and perceived stress, with the indirect path of mindfulness, explain 48% of the variance in activity interference. Pain intensity and mindfulness explain 39% of the variance in perceived stress. Pain intensity, activity interference, perceived stress, with the indirect path of mindfulness accounted for 50% of the variance in catastrophizing. Activity interference, perceived stress, catastrophizing and mindfulness with the indirect path of pain intensity accounted for 63% of the variance in depressive symptoms.

In addition, the standardized parameter estimates for the structural paths in the respecified model were all statistically significant and substantively meaningful. A schematic representation of the respecified model with parameter estimates and R^2 values is displayed in Figure 2.

Results showed that mindfulness ($\beta = -.14$, $p < 0.01$), perceived stress ($\beta = -.18$, $p < 0.01$), activity interference ($\beta = -.34$, $p < 0.01$) and catastrophizing ($\beta = -.32$, $p < 0.01$) had direct associations with depressive symptoms. Pain intensity ($\beta = -.15$, $p < 0.01$), activity interference ($\beta = -.36$, $p < 0.01$) and perceived stress ($\beta = -.35$, $p < 0.01$) had direct associations with catastrophizing. Pain intensity ($\beta = -.29$, $p < 0.01$) and perceived stress ($\beta =$

-.55, $p < 0.01$) had direct associations with activity interference. Pain intensity ($\beta = -.26$, $p < 0.01$) and mindfulness ($\beta = -.56$, $p < 0.01$) had direct associations with perceived stress.

Importantly, mindfulness had an indirect association with activity interference ($\beta = -.31$, $p < 0.05$) through perceived stress; an indirect association with catastrophizing ($\beta = -.31$, $p < 0.05$) through perceived stress and activity interference; and an indirect association with depressive symptoms ($\beta = -.30$, $p < 0.05$) through perceived stress, activity interference and catastrophizing. Pain intensity had an indirect association with activity interference ($\beta = -.15$, $p < 0.05$) through perceived stress; an indirect association with catastrophizing ($\beta = -.25$, $p < 0.05$) through perceived stress and activity interference; and an indirect association with depressive symptoms ($\beta = -.32$, $p < 0.05$) through perceived stress, activity interference and catastrophizing. Perceived stress had an indirect association with catastrophizing ($\beta = -.20$, $p < 0.05$) through activity interference; and an indirect association with depressive symptoms ($\beta = -.36$, $p < 0.05$) through activity interference and catastrophizing. Activity interference had an indirect association with depressive symptoms ($\beta = -.12$, $p < 0.05$) through catastrophizing.

Discussion

The findings in this study were mostly consistent with the hypothesized behavioral activation model of depression. To begin, our results showed that the protective factor of mindfulness had a direct association with perceived stress and depressive symptoms. This finding is concurrent with the growing body of literature indicating that mindfulness-based interventions appear to be efficacious in protecting against psychological distress and depression in people with FM (Grossman et al., 2004; Sephton et al., 2007; Song et al., 2014). Results from our study also indicate that mindfulness has an indirect association with activity interference through perceived stress and an indirect association with pain catastrophizing through both perceived stress and activity interference. These results are somewhat similar to a finding by Schütze et al. (2010) that demonstrated mindfulness moderates the relationship between pain intensity and pain catastrophizing. Finally, our study also showed that mindfulness had a strong indirect association with depressive symptoms through direct and negative associations with stress, activity interference and catastrophizing. However, there was no direct association between pain intensity and mindfulness. Though previous research has shown that mindfulness is linked to lower levels of pain intensity (Song et al., 2014), the reverse may not be true. By removing this path, it improved the fit to the data. Overall, these combined results support the role of mindfulness as a protective factor in a model of depression such as the IMD, which proposes that depressive symptoms is in part caused and maintained by predisposing characteristics consisting of immunities and vulnerabilities.

Pain intensity had a direct association with perceived stress, activity interference and catastrophizing. This finding is consistent with our expectations as pain is a primary symptom of FM, and historically, it has been a reliable and strong predictor of adverse consequences to chronic pain (Karoly & Ruehlman, 2007; Sullivan et al., 2001; Zautra et al., 1999). Pain intensity had an indirect association with depressive symptoms, yet it did not have a direct association with depressive symptoms. We removed this direct path and re-

specified the model, which provided a better fit to the data. This nonsignificant finding is inconsistent with prospective studies that have suggested there may be a causal relation between chronic pain and depression (Gerrits et al., 2014). However, pain intensity may not be statistically significant after other factors are held constant. This finding suggests pain intensity may have a stronger influence on other factors such as activity interference, which in turn directly relates to depressive symptoms.

Perceived stress had a direct association with activity interference and catastrophizing, and an indirect association with depressive symptoms. This result was expected as the associations between perceived stress and activity interference (González-Ramírez et al., 2011), pain catastrophizing (Smeets et al., 2006) and depression (Turner et al., 2002) among people with FM and other pain disorders are well documented in the literature. Activity interference had a direct association with catastrophizing, which is consistent with Lewinsohn et al.'s (1985) theory. Finally, pain catastrophizing had a direct association with depressive symptoms, which is in line with the vast literature on the associations between pain catastrophizing and depression among people with FM and other pain disorders (Edwards et al., 2006; Linton & Bergbom, 2011). The aforementioned results are largely congruent with Lewinsohn's et al. (1985) prior research, which suggests stressful life events like pain intensity and perceived stress can interfere with daily activities and trigger negative reactions such as catastrophizing, and then lead to depression.

There are several limitations to our study. First, our study featured a cross-sectional research design and we collected descriptive and correlational data. As we did not actively manipulate variables, the cause-and-effect relationships in the theoretical model cannot be clearly established. Second, this study used a convenience sample and participants volunteered. There could be unique differences among those that chose to participate in this study and those that opted out. Third, as our sample was predominantly composed of Caucasian, well-educated, female adults, and participants from community and clinical groups, our results may not be generalizable to all people with FM. Finally, in an effort to limit the number of items in the survey and time burden on participants, brief measures were selected that may not assess all aspects of the theoretical constructs. The measures were self-report, which may yield results vulnerable to bias and error. Given that the quantification of mindfulness is still in its infancy, there may be added difficulty in measuring this particular concept (Grossman, 2008). In addition, the survey was completed online, which means that our sample is more representative of adults with chronic pain who have knowledge about or access to computers.

Conclusions

An emerging body of literature now exists documenting the benefits of mindfulness practice for persons with FM, yet the role of mindfulness in a theoretical model of depression has not been explored. The present study provides initial empirical evidence for the protective factor of mindfulness within a behavioral activation model for depression in people with FM. To better understand the mechanisms underlying depressive symptoms in chronic pain, future research should continue to investigate theories on both immunities and vulnerabilities for depressive symptoms among people with FM. Contemporary approaches to behavioral

activation should incorporate mindfulness-based strategies from interventions such as Mindfulness-Based Cognitive Therapy or Acceptance and Commitment Therapy and be implemented with people with FM, albeit with modifications to address illness-specific factors.

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Figure 1.
Hypothesized behavioral activation model of depression for people with fibromyalgia.

Figure 2.
Respecified behavioral activation model of depression for people with fibromyalgia.

Table 1

Descriptive statistics of the used measurements.

Measures	Total score range	<i>M</i>	<i>SD</i>
NRS	0–10	6.44	1.93
WHO-DAS 2.0	0–48	23.59	8.83
PSS-4	0–16	8.89	3.24
CAMS-R	12–48	23.64	5.13
PCS	0–52	23.25	13.0
PHQ-9	0–27	14.32	5.99

NRS: The 0–10 Numerical Rating Scale; WHO-DAS 2.0: The World Health Organization Disability Assessment Schedule II; PSS-4: The 4-item Perceived Stress Scale; CAMS-R: The Cognitive and Affective Mindfulness Scale-Revised; PCS: The Pain Catastrophizing Scale; PHQ-9: The Patient Health Questionnaire-9.

Table 2

Pearson correlations between the measured variables.

	1	2	3	4	5	6
1. NRS	–	.43**	.31**	.03	.47**	.36**
2. WHO-DAS 2.0		–	.65**	–.40**	.63**	.69**
3. PSS-4			–	–.46**	.58**	.67**
4. CAMS-R				–	–.30**	–.42**
5. PCS					–	.67**
6. PHQ-9						–

NRS: The 0–10 Numerical Rating Scale; WHO-DAS 2.0: The World Health Organization Disability Assessment Schedule II; PSS-4: The 4-item Perceived Stress Scale; CAMS-R: The Cognitive and Affective Mindfulness Scale-Revised; PCS: The Pain Catastrophizing Scale; PHQ-9: The Patient Health Questionnaire-9.

** Correlation is significant at the 0.01 level (two-tailed).