Examining Trait Mindfulness, Emotion Dysregulation, and Quality of Life in Multiple Sclerosis

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Objective: Dispositional mindfulness exhibits a positive association with quality of life (QoL). One potential mechanism for this association is enhanced emotion regulation abilities. Individuals with multiple sclerosis (MS) experience a range of physical, cognitive, and affective impairments, thus reducing overall QoL. The current cross-sectional study examines the relation between trait mindfulness and QoL, mediated by emotion dysregulation in individuals with MS. Method: Ninety-five participants with self-reported MS completed an online survey that incorporated self-report measures of trait mindfulness, emotion dysregulation, and QoL. Although clinically significant depression was exclusionary, we observed a wide range of depressive symptoms in our sample. These scores were thus entered as a moderator in the mediation analysis. Results: Dispositional mindfulness correlated positively with QoL, with lower emotion dysregulation partially mediating the correlation. Depression scores moderated the observed mediation, such that the effect was stronger in those with higher symptoms of depression. Conclusions: Trait mindfulness is positively associated with QoL in individuals with MS. Reduced emotion dysregulation may be a critical pathway linking mindfulness and QoL in MS, especially in those with higher symptoms of depression.

Keywords: multiple sclerosis, trait mindfulness, emotion regulation, quality of life

Multiple sclerosis (MS), a neurodegenerative disease impacting widespread physical (Martin et al., 2006), cognitive (Prakash, Snook, Lewis, Motl, & Kramer, 2008), and affective functioning (Siegent & Abernethy, 2005), results in substantially reduced quality of life (QoL) on average (see Benito-León, Morales, Rivera-Navarro, & Mitchell, 2003, for a review). Specifically, the MS-related symptoms of fatigue (Pitton-Vouyovitch et al., 2006), cognitive decrements (Prakash et al., 2008), physical impairment (Benedict et al., 2005), depression (Lobentanz et al., 2004), and poor sleep quality (Lobentanz et al., 2004) have all been shown to be potential contributors to this reduction. Of these, the presence of depressive symptoms is the most critical predictor of QoL, with depression explaining more variance in QoL than disability status (Lobentanz et al., 2004). In fact, clinically significant depression is prevalent in 50% of the population (Sadovnick et al., 1996), suggesting the need to examine constructs that positively associate with overall QoL and result in reduced depression.

One could speculate that this robust connection between depressive symptoms and QoL stems from an underlying vulnerability to difficulties in emotion regulation in those with MS. In fact, there is some support for emotion regulation deficits in individuals with MS (Passamonti et al., 2009; Prochnow et al., 2011), although few studies have examined this construct explicitly within this population. Defined as a set of conscious and unconscious processes, emotion regulation allows an individual to manage or influence how long, when, and which emotions arise (Gross, 2002). These include the acceptance and clarity of one’s emotions (Grazt & Roemer, 2004); awareness of the stimuli evoking them; goals of enhancing, maintaining, or dampening emotions; and the range of strategies one possesses to carry out these goals (Gross & Jazaieri, 2014). Emotion regulation deficits in community samples have been observed within a range of psychological disorders (see Aldao, Nolen-Hoeksema, & Schweizer, 2010, for a review). Among individuals with MS, Phillips et al. (2009) found support for a significant relationship between emotion regulation strategies and QoL, such that greater use of cognitive reappraisal (a putatively adaptive strategy) was associated positively with QoL. Relatedly, individuals with MS demonstrate greater levels of alexithymia (Prochnow et al., 2011) and utilize greater emotion-based coping strategies, which are associated with poorer QoL (Montiel & Bungener, 2007). The reviewed literature provides support for a link between potential vulnerability for emotion regulation deficits and QoL metrics in individuals with MS. The observed emotion regulation deficits could thus be targeted in order to preserve and improve QoL within this population. This becomes critical given the enduring nature of the illness and current lack of a clear etiology or cure. In the current study, we examine the role of one such pertinent factor, dispositional mindfulness, in explaining variance in QoL in individuals with MS.
Dispositional mindfulness, or the ability of an individual to intentionally attend—with receptive awareness—to the experiences of the present moment (Brown & Ryan, 2003), shows positive associations with a variety of metrics of QoL (see Kendler, Kane, & Smoski, 2011, for a review). Specifically, mindfulness is associated with higher levels of life satisfaction (Brown & Ryan, 2003; Kong, Wang, & Zhao, 2014), subjective well-being (Schutte & Malouff, 2011), optimism (Brown & Ryan, 2003; Weinstein, Brown, & Ryan, 2009), and positive affect (Brown & Ryan, 2003). Researchers have found this association in both healthy (de Frias & Whyne, 2014) and clinical populations, such as those with chronic fatigue syndrome (Surawy, Roberts, & Silver, 2005) and fibromyalgia (Grossman, Tiefenthaler-Gilmer, Raysz, & Kesper, 2007). Given converging evidence in support of mindfulness’ prophylactic effects, one aim of the contemporary study of mindfulness is to elucidate underlying mechanisms of change. Conceptually, greater trait mindfulness involves increased levels of awareness, nonjudgment, and nonreactivity toward internal phenomena (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006) such as emotions, affording the potential for an enhancement in emotional regulatory ability. In fact, a growing body of evidence suggests enhanced emotion regulation may be at the forefront of the proposed theoretical mechanisms of improved well-being (e.g., Arch & Craske, 2006; Coffey, Hartman, & Fredrickson, 2010; Goldin & Gross, 2010; Taylor et al., 2011).

Supporting the hypothesis that increased emotion regulation is an important pathway linking mindfulness to psychological prophylaxis, previous empirical evidence corroborates the connection between higher levels of trait mindfulness and reduced perceived emotion regulation difficulties (Hill & Updegraff, 2012; Prakash, Hussain, & Schirda, in press; Roemer et al., 2009). Trait mindfulness is also associated with greater use of putatively adaptive regulation strategies, such as cognitive reappraisal (Jermann et al., 2009), and reduced use of putatively maladaptive strategies, such as suppression (Tamagawa et al., 2013) and rumination (Borders, Earleywine, & Jajodia, 2010). More recent literature has investigated the neural correlates of mindfulness (see Chiesa, Serretti, & Jakobsen, 2013, for a review). Mindfulness associates with both the enhancement of top-down regulation, or an increase in the neural activation of the prefrontal cortex (PFC), which then modulates the activity of the limbic structures such as the amygdala (Farb et al., 2007); and bottom-up regulation (Taylor et al., 2011), which involves becoming less reactive to the world, neurally expressed by reduced amygdala activation without PFC modulation. Overall, there is considerable support for the interplay between mindfulness and emotion regulation (Chambers, Gullone, & Allen, 2009), with both theoretical models and empirical studies suggesting emotion regulation to be an important link in the mechanistic pathway from mindfulness to well-being. In order to examine the interplay between mindfulness and emotion regulation in individuals with MS, this cross-sectional study investigated whether perceived difficulties with emotion regulation would mediate the association between mindfulness and QoL. Although mediational analyses can be problematic in a cross-sectional data set because of assumptions of causality (Lindenberger & Pötter, 1998), the reviewed literature provides a strong rationale for the study of emotion regulation as a pathway between mindfulness and QoL in MS.

Although still in its infancy, preliminary evidence within this population provides support for the positive association of mindfulness with both emotion regulation and QoL. In a recent study with MS individuals, Senders, Boudrette, Hanes, Yadav, and Shinto (2014) found positive associations between trait mindfulness and enhanced well-being, better coping skills, and decreased psychological distress. Higher levels of trait mindfulness were also positively associated with higher levels of positive affect and relationship satisfaction, and negatively associated with anxiety symptoms (Pakenham & Samios, 2013). Furthermore, mindfulness training—in the format of an 8-week mindfulness-based stress reduction program utilizing meditation practice and gentle yoga to increase one’s mindfulness skill set—improved overall QoL and reduced symptoms of depression and anxiety in individuals with MS (Grossman et al., 2010).

In summary, MS has a profound impact on overall QoL, which is especially salient in those with greater affective disturbance. Mindfulness is a promising candidate for maintaining or enhancing QoL in these individuals. In this study, we examined associations between trait mindfulness, emotion dysregulation, and QoL in individuals with MS. We hypothesized a positive association between trait mindfulness and QoL, and a negative association between trait mindfulness and emotion dysregulation. Further, we hypothesized lower perceived emotion dysregulation to mediate the association between mindfulness and QoL, such that a significant portion of mindfulness-related variance in QoL would be accounted for by reduced emotion dysregulation.

Method

Participants and Procedure

Ninety-five participants with self-reported MS (M age = 44 years; 83% female) were recruited to participate in an online study with two primary aims: (a) to assess the relation between emotion dysregulation, trait mindfulness, and QoL in individuals with MS; and (b) to collect normative data on health-related affective stimuli (data for an unrelated project). The sample was recruited from a database of past laboratory participants (35%); ResearchMatch (44%), a national health volunteer registry that was created by several academic institutions and supported by the U.S. National Institutes of Health as part of the Clinical Translational Science Award program; and online/flyer advertisements (21%). Participants were included in the study if they had a self-reported diagnosis of MS, were aged between 18 to 55 years, and were from the United States. Online platforms have been previously utilized to recruit individuals with MS, based on a self-report diagnosis (Green & Todd, 2008; Hadgkiss et al., 2013; Larocca, 2011).

Participants were provided a link to an online survey, which was implemented using Qualtrics software, Version 2013 (Qualtrics, Provo, UT). In the survey, participants were presented with a set of questions inquiring various demographic and disease-related pieces of information, as well as a series of self-report questionnaires. Information about the participant’s typical MS-related symptoms, current medications, and type of MS was checked to ensure consistency with what would be expected of an MS participant. Participants were excluded if they reported the presence of any comorbid neurological disorder or psychiatric disorder, and if their recorded IP address had previously been reported as spam.
producing. In the case that a participant completed multiple surveys, the first survey was recorded. All participants provided informed consent before participating, as required by The Ohio State University Review Board. All participants were compensated with a $5 Amazon gift card for their participation.

Questionnaires

**Trait mindfulness.** Trait mindfulness was measured using the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006). This self-report questionnaire, which includes 39 items measured on a 5-point rating scale from 1 (never) to 5 (always), measures five unique facets associated with the overarching construct of mindfulness disposition. The facets included are observing, describing, acting with awareness, nonjudgment, and nonreactivity. All facets have been found to have adequate to good construct validity (Baer et al., 2008; de Bruin, Topper, Muskens, Bögels, & Kamphuis, 2012). Higher scores on this questionnaire reflect higher levels of trait mindfulness. For this study, Cronbach’s alpha for the total score, including all facets, equals .929.

**Emotion dysregulation.** The Difficulties in Emotion Regulation Scale (DERS; Graft & Roemer, 2004) is a 36-item questionnaire that uses a 5-point rating scale from 1 (almost never) to 5 (almost always). This measure was employed to assess an individual’s subjective rating of their typical difficulties in regulating their emotions. This multidimensional measure incorporates many aspects of emotion regulation beyond the control and modulation of emotions and emotional experiences. The facets incorporated are difficulties engaging in goal-directed behavior (Goals), lack of emotional awareness (Awareness), lack of emotional clarity (Clarity), nonacceptance of emotional responses (Nonacceptance), impulse control difficulties (Impulse), and limited access to emotion regulation strategies (Strategies). Higher scores on this scale indicate greater perceived difficulties in emotion regulation capabilities. For this study, Cronbach’s alpha for the total score, including all facets, equals .959.

**QoL.** Domain-specific health-related QoL was measured using the World Health Organization Quality of Life-BREF (WHOQOL-BREF; WHOQoL Group, 1998), which is a 26-item questionnaire constructed as an abbreviated version of the WHOQOL-100. Four domains are measured: psychological (six items), environmental (eight items), physical (seven items), and social (three items), as well as one facet of overall QoL (two items). Each item is measured on a 5-point rating scale. Higher scores on this questionnaire are associated with better perceived health-related QoL. For this study, Cronbach’s alpha for the total score, including all domains, equals .933.

The Satisfaction with Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985), a five-item questionnaire, was used to evaluate one’s general assessment of their overall QoL. Each item uses a 7-point rating scale ranging from 1 (strongly disagree) to 7 (strongly agree). Higher scores on this questionnaire are associated with greater perceived general QoL. Cronbach’s alpha for this study equals .884.

**Depressive symptoms.** Depressive symptoms were measured using a 20-item version of the self-report Beck Depression Inventory-II scale (BDI-II; Beck, Steer, Ball, & Ranieri, 1996). The BDI-II is one of the most commonly used depression scales in individuals with MS and is considered to be the optimal approach to screen for depression symptoms in patients with MS (Goldman Consensus Group, 2005). As the questionnaire was administered online, we removed the question inquiring about suicidal behavior to avoid ethical conflict. Cronbach’s alpha for this study equals .929.

**Disease characteristics.** Individuals were asked to self-report their total disease duration in years, as well as their diagnosed type of MS. Additionally, the self-report Expanded Disability Status Scale (EDSS; Kurtzke, 1983) was employed to assess the deficits experienced in the overall functioning of eight functional systems. The EDSS is a commonly used measure of disease severity in the MS literature, and the validated self-report version has been shown to have a strong correlation with the physician-reported version of EDSS (r = .87; Bowen, Gibbons, Gianas, & Kraft, 2001).

**Statistical Analyses**

All analyses were performed using SPSS 21.0 (IBM, Armonk, NY). All 95 participants were included in the analyses, as there were no missing data. Composite scores were created for trait mindfulness, emotion dysregulation, and QoL. Specifically, individual facet scores were averaged for the FFMQ, DERS, and HQOQOL-BREF separately to create a single score for each measure. As can be seen in Table 1 (A through C), the individual facets’ scores for these questionnaires were highly correlated, justifying the creation of a composite score for these constructs.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Bivariate Correlations Between the Composite Variables and the Individual Facets of Mindfulness Disposition, Emotion Dysregulation, and Quality of Life</th>
</tr>
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<tbody>
<tr>
<td>Measures</td>
<td>1</td>
</tr>
<tr>
<td>(A) Quality of Life (QoL)</td>
<td></td>
</tr>
<tr>
<td>1. Overall QoL</td>
<td>—</td>
</tr>
<tr>
<td>2. Physical</td>
<td>.72**</td>
</tr>
<tr>
<td>3. Psychological</td>
<td>.65**</td>
</tr>
<tr>
<td>4. Social</td>
<td>.43**</td>
</tr>
<tr>
<td>5. Environmental</td>
<td>.55**</td>
</tr>
<tr>
<td>6. SWLS</td>
<td>.58**</td>
</tr>
<tr>
<td>(B) Difficulties in Emotion Regulation Scale (DERS)</td>
<td></td>
</tr>
<tr>
<td>1. Nonacceptance</td>
<td>—</td>
</tr>
<tr>
<td>2. Goals</td>
<td>.68**</td>
</tr>
<tr>
<td>3. Impulse</td>
<td>.67**</td>
</tr>
<tr>
<td>4. Awareness</td>
<td>.52**</td>
</tr>
<tr>
<td>5. Strategies</td>
<td>.81**</td>
</tr>
<tr>
<td>6. Clarity</td>
<td>.64**</td>
</tr>
<tr>
<td>(C) Five Facet Mindfulness Questionnaire (FFMQ)</td>
<td></td>
</tr>
<tr>
<td>1. Observing</td>
<td>—</td>
</tr>
<tr>
<td>2. Describing</td>
<td>.42**</td>
</tr>
<tr>
<td>3. Acting with Awareness</td>
<td>.24**</td>
</tr>
<tr>
<td>4. Nonjudging</td>
<td>.01**</td>
</tr>
<tr>
<td>5. Nonreacting</td>
<td>.39**</td>
</tr>
<tr>
<td>(D) Composite variables</td>
<td></td>
</tr>
<tr>
<td>1. FFMQ</td>
<td>—</td>
</tr>
<tr>
<td>2. DERS</td>
<td>−.76**</td>
</tr>
<tr>
<td>3. QoL</td>
<td>.63**</td>
</tr>
<tr>
<td>4. BDI-II</td>
<td>−.65**</td>
</tr>
</tbody>
</table>

**Note.** SWLS = Satisfaction with Life Scale; BDI-II = Beck Depression Inventory-II.

*p ≤ .05. **p ≤ .01.
Additionally, given the high correlations between the two QoL measures, the standardized scores of the WHOQOL-BREF and SWLS were merged, by averaging the two measures, to create an overall composite of QoL that incorporates both domain-specific and general aspects of QoL. The composite scores for each of the constructs were tested for the presence of outliers, which were defined as any z score ±2.5 standard deviations from the mean. Any score exceeding this threshold was replaced with a score equivalent to 2.5 standard deviations. Normality of data was checked using Kolmogorov–Smirnov test for normality. Bivariate correlations (Pearson’s for normal distributions and Spearman’s rho for non-normal distributions) are presented in Table 1 between the individual facets of each composite variable (A through C) and the overall composite variables of interest (D).

Next, a simple mediation analysis (Preacher & Hayes, 2008) was employed to test the hypothesis that emotion dysregulation plays a mediating role in the relationship between trait mindfulness and QoL. Here, we utilized the PROCESS macro for SPSS to apply a bias-corrected nonparametric bootstrapping technique with 5,000 resamples to estimate the direct, indirect, and total effects of trait mindfulness on QoL. Bootstrapping is considered a robust method for determining indirect effects, as it does not make the assumption of a normal sampling distribution (Preacher & Hayes, 2008). Significant indirect and direct effect point estimates were determined based on the criterion that the 95% confidence interval (CI) not include zero. The indirect effect (ab) in this model is the effect of trait mindfulness on QoL accounted for by emotion dysregulation. This statistically examines the product between (a) the effect of mindfulness on emotion dysregulation, and (b) the effect of emotion dysregulation on QoL. The direct effect (c’) is the effect of mindfulness on QoL after statistically controlling for emotion dysregulation. Lastly, the total effect (c) is the sum of the indirect effect and the direct effect.

Although a clinical diagnosis of a psychiatric disorder such as depression was an exclusionary criterion, a wide range of depressive symptoms was found utilizing the BDI-II in our sample (M = 14.3, SD = 10.2; range = 0 to 43). This suggests that there may be individuals that have gone undiagnosed in our sample. This finding is consistent with previous studies that have excluded participants with a self-reported psychiatric diagnosis, but still report a wide range of depressive symptoms (Andrews-Hanna et al., 2013). Given this range of depressive symptoms, an exploratory moderated mediation model including a dichotomous depressive symptom variable was conducted. We did a median split of the BDI-II scores to examine the moderating effect of depression. The two groups comprised of 48 individuals with a score <13, and 47 individuals with a score ≥13. It was hypothesized that depressive symptoms would moderate the strength of the mediated relation between trait mindfulness and QoL via emotion dysregulation. We tested moderated mediation by assessing for the presence of (a) a moderation of at least one path in the mediation model, and (b) a conditional indirect effect, meaning the indirect effect must be dependent at different levels of the moderator (Preacher, Rucker, & Hayes, 2007). Specifically, we examined the interaction between trait mindfulness and depressive symptoms in predicting emotion dysregulation; the interaction between depressive symptoms and emotion dysregulation in predicting QoL; and the interaction between trait mindfulness and depressive symptoms predicting QoL. If moderated mediation exists, the strength of the relation between trait mindfulness and QoL through emotion dysregulation would be altered at the two levels of depressive symptoms, high (1) and low (0). We employed Hayes’s index of moderated mediation included in the PROCESS macro for SPSS (Hayes, in press) to test for the presence of moderated mediation. This index tests for a nonzero weight of the moderator in the indirect effect process. Here, a bootstrapping technique with 5,000 resamples was used providing a 95% CI; if the CI does not include zero, moderated mediation is indicated.

**Results**

Table 2 presents the descriptive statistics, including means, standard deviations, and ranges for the variables of interest. For the composite variables, outlier corrected values are presented. Bivariate correlations among the various subfacets of each composite variable are presented in Table 1 (A through C), as well as between the overall composite variables (D). Consistent with our hypotheses, we found evidence for a significant association between higher dispositional mindfulness and lower emotion dysregulation (p = .076) and higher QoL (r = .63) in our sample of individuals with MS. Additionally, emotion dysregulation was also associated with QoL (p = .59), such that individuals with lower emotion dysregulation reported higher QoL.

**Emotion Dysregulation Mediates the Association Between Trait Mindfulness and QoL**

We utilized a simple mediation model with bootstrapping to estimate the direct and indirect effects of mindfulness (Preacher et al., 2007). We found that the effect of trait mindfulness on emotion dysregulation was significant (B = −4.46, SE = .386, p < .001), such that higher levels of trait mindfulness were associated with lower perceived emotion dysregulation. We also found a significant relation between emotion dysregulation and QoL (B = −.021, SE = .009, p = .02), such that lower emotion dysregulation was associated with better QoL. The total effect of the relation between trait mindfulness and QoL, or the sum of the direct and indirect effects, was equal to a point estimate of .260 (see Figure 1). The indirect effect, assessing the variance explained by emotion dysregulation in the relation between trait mindfulness and QoL, was significant (point estimate of .094; 95% CI [.022, .161]). This suggests that emotion dysregulation in individuals with MS mediates the association between trait mindfulness and QoL. The direct effect of emotion dysregulation on QoL remained significant (point estimate of .165; 95% CI [.065 to .266]) in this model, indicating that the relationship between trait mindfulness and QoL, was only partially mediated by emotion dysregulation (see Figure 1). These results indicate emotion dysregulation to be a partial mediator in the relation between trait mindfulness and QoL.

**Depressive Symptoms As a Moderator in the Association Between Trait Mindfulness and QoL via Emotion Dysregulation: An Exploratory Analysis**

Given our finding that emotion dysregulation significantly partially mediated the relation between trait mindfulness and QoL, we tested the hypothesis that depressive symptoms may play a role in moderating this mediation pathway.
Of the three interactions tested in the model, the interaction between trait mindfulness and depressive symptoms in predicting emotion dysregulation was the only significant interaction ($B = -2.01, t = -2.39, p = .02$). The interactions between trait mindfulness and depressive symptoms in predicting QoL ($B = -0.25, t = -2.53, p = .01$), and emotion dysregulation with depressive symptoms predicting QoL ($B = -0.003, t = -1.33, p = .19$), were not significant. Therefore, depressive symptoms were only included as a moderator in the pathway between trait mindfulness and emotion dysregulation in the final model, given the significant interaction between trait mindfulness and depressive symptoms in predicting emotion dysregulation (see Figure 1). In this model, we examined the conditional indirect effect of trait mindfulness on QoL through emotion dysregulation at the two levels (1, 0) of the moderator. For this, we first examined the 95% CI around the conditional indirect effect at the two levels of the moderator utilizing a bootstrapping method of 5,000 resamples (Preacher & Hayes, 2008). For those with low depressive symptoms (0) the indirect point estimate was .054, with 95% CI [.016, .106], and for those with high depressive symptoms (1) the indirect effect point estimate was .097, with 95% CI [.027, .169]. Therefore, we found that neither CI included zero, indicating that for both groups, emotion dysregulation significantly partially mediates the relation between trait mindfulness and QoL.

Next, we examined the index of moderated mediation (Hayes, in press), which was created by multiplying the coefficient for the interaction between trait mindfulness and depressive symptoms on emotion dysregulation (~2.012), and the coefficient for emotion dysregulation on QoL (~.0212), with the difference between high (1) and low (0) levels of depressive symptoms (here, 1). Thus, the index was equal to .043, with a 95% CI surrounding the index of moderated mediation of .010 and .102, which also did not include zero. Thus, our results showed the conditional indirect effects were significantly different in each of the two groups. In other words, the indirect effect of trait mindfulness on QoL through emotion dysregulation is stronger in those that have higher depressive symptoms than in those that have low depressive symptoms.

### Discussion

The primary purpose of this study was to investigate the relationships between dispositional mindfulness, emotion dysregulation...
tion, and QoL in those with MS. Considering the variability and unpredictability of this disease course (Noseworthy, Luchinetti, Rodriguez, & Weinshenker, 2000), the resulting physical, sensory, cognitive, and affective limitations (Prakash et al., 2008), including an alarmingly high rate of depression and worry within this population (Korostil & Feinstein, 2007; Sadovnick et al., 1996), it is paramount to address the relative dearth of research investigating potential psychological factors in influencing QoL in this population. Dispositional mindfulness, defined as the ability to attend to the experiences of the present moment, has been positively associated with myriad psychological benefits, ranging from lower perceived stress (Prakash et al., 2014), reduced rates of anxiety and depression (Desrosiers, Vine, Klemanski, & Nolen-Hoeksema, 2013), reduced pain (Rosenzweig et al., 2010) to increases in subjective well-being, life satisfaction, and overall QoL (see Keng et al., 2011, for a review). In this study, we thus examined the associations between the ability to cultivate present-moment awareness and QoL, within individuals with MS. This research, we believe, is critical within this population, given the variable and rather unpredictable nature of the disease, which likely results in significantly greater pathological worry in individuals with MS than healthy controls (Bruce & Arnett, 2009), with the majority of these worries, especially in young adults, being about the future impact of the disease on their lives (Buchanan et al., 2010).

In support of our hypothesis, we found a positive association between higher levels of trait mindfulness and better QoL in individuals with MS. Additionally, our findings add to the previous literature in a meaningful way by elucidating lower emotional dysregulation as one valid pathway by which mindfulness impacts QoL in those with MS. We found that emotion dysregulation partially mediated the association between mindfulness and QoL. Furthermore, symptoms of depression moderated the mediated pathway, such that the conditional indirect effect of mindfulness on QoL through emotion dysregulation was stronger in those with greater depressive symptoms than those with lower reported depressive symptoms.

Although the investigation of mindfulness is in its infancy in individuals with MS, our study corroborated the results observed by Senders et al. (2014), in which they found a positive association between trait mindfulness and QoL in individuals with MS. In our study, the direct relation between mindfulness and QoL remained significant even after controlling for emotion dysregulation, suggesting a need to further explore other ways of operationalizing emotion regulation, as well as the likelihood for other relevant factors to connect the two constructs. These cross-sectional results lend support to the idea that the ability to stay present-focused is associated with a better QoL in individuals with MS. Contributing to this positive association, there is at least one randomized controlled trial providing support for improved QoL after an 8-week mindfulness training program in individuals with MS (Grossman et al., 2010). Although this study provided the first evidence for improved QoL following an intervention, the comparison group was a wait-listed group. Future research would thus benefit from evaluating the efficacy of a mindfulness-training group, relative to an active control group, matched for duration, and format of group in improving overall QoL in this population.

Contributing to the literature examining the mechanisms of mindfulness, our results, from the current cross-sectional study, provide evidence for lower perceived emotion dysregulation as one potential pathway through which mindfulness may positively affect QoL. In dissecting this pathway, there are two relevant associations: first, between mindfulness and emotion dysregulation, and second, between emotion dysregulation and QoL. Previous studies assessing self-report emotion regulation and dispositional mindfulness also have found a significant relationship (e.g., Hill & Updegraff, 2012; Prakash et al., 2014; Roemer et al., 2009). Extending this to a neurological condition like MS, in which individuals experience a rather variable and unpredictable disease course, our findings suggest that trait mindfulness and perceived difficulties in emotion regulation are related in a significant way. Future cross-sectional studies could aim to further understand the relation between trait mindfulness and specific emotion regulation strategies, such as cognitive reappraisal and suppression, which are associated with trait mindfulness in other populations (e.g., Jermann et al., 2009).

The findings of this study also corroborate past evidence of a relationship between emotion regulation and QoL in individuals with MS. Phillips et al. (2009) completed the only other study, to our knowledge, investigating the relationship between emotion regulation and QoL in MS. Their study operationalized emotion regulation as the use of particular emotion regulation strategies, and revealed that greater use of cognitive reappraisal was associated with better psychological and environmental QoL, as measured by the WHOQOL-BREF. Our findings expand upon these by combining variance from both the WHOQOL-BREF, as well as the SWLS, which incorporates a more generic definition of QoL in comparison with the more health-related QoL of the WHOQOL-BREF. Collectively, these data provide clear evidence for the critical inclusion of emotional health in literature on QoL in MS in addition to the already well-studied physical and cognitive limitations.

In our sample, exploratory analyses highlighted the important role symptoms of depression play in the pathway between trait mindfulness and QoL. We found a higher effect size for the mediation analyses in those with higher levels of depression. Provided these exploratory findings are replicated, we speculate these findings implicate mindfulness as a more important protective factor in those with higher depressive symptoms. Studies investigating differences in coping strategies in those with higher depressive symptoms have found lower reported use of positive reappraisal and problem solving, as well as greater escape-avoidance (Aikens, Fischer, Namey, & Rudick, 1997). Evidence from a recent longitudinal study found depressive symptoms in individuals with MS to remain relatively static over the course of a 4-year period, showing a more chronic trajectory in comparison with the typical, shorter trajectory of depression in the general population (Koch et al., 2014). Thus, research into the roles trait mindfulness and emotion regulation may play in those with MS may be novel, as the depression symptoms within this population evolve differently than a community population. Future studies should aim to investigate the changes in emotion regulation evoked by mindfulness training in those with higher reported depressive symptoms.

It is important to consider the study in the context of some limitations. First, the study employed a cross-sectional design, thus not lending itself to the rigorous nature of a controlled experiment. Although we examined difficulties in emotion regulation as me-
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diating the relationship between dispositional mindfulness and QoL, the cross-sectional nature of the study prevents us from making any inferences of causality. Our results provide an important first step to further examine the possible causal link between mindfulness and QoL in this population. A randomized controlled trial comparing mindfulness training, which focuses on building concentrative attention and emotional nonreactivity, with an active control group, which matches the mindfulness training group—especially in terms of it being a forum of social support for the participants—would provide us with the necessary data to make causal claims regarding the efficacy of mindfulness. Additionally, including measures of emotional regulation abilities before, during, and after the intervention would allow for examining the mediating role of emotional regulation in this pathway.

A second limitation of the study was that it was completed online. As such, we did not validate the authenticity of the subjects recruited for the study. That being said, the majority of participants (79%) were past participants or those coming from a national reputable recruitment registry, ResearchMatch. Participants in our study were also highly educated; 67% had at least a college degree, which limits our ability to generalize to those with less education. Our sample also underrepresented the progressive subtype of MS, which shows a prevalence rate of 10% to 15% (Miller & Leary, 2007), and thus our results may not translate to that population. Further, our study used self-report measures to assess the variables of interest, which may reduce the validity of our findings. That is, because data on all measures were collected using self-report, it is possible that the different constructs are correlated because they are all self-report. Future research employing behavioral tasks to assess emotional regulation would be critical to replicate and extend the current research.

In conclusion, we found support in the current study for the relationship between trait mindfulness and QoL in those with MS. Many individuals with MS experience an unpredictable and heterogeneous disease course, which is considered a key feature of the disease. As such, these individuals experience heightened levels of illness-related uncertainty, which is associated with greater escape-avoidance coping and depressive symptoms in individuals with MS (Lynch, Kroencke, & Denney, 2001). Thus, by encouraging an implementation of a more present-focused and nonjudgmental way of living, mindfulness may provide one way of addressing the future-oriented uncertainty of their progression and related avoidant coping use in individuals with MS. Additionally, both in the form of formal practice and everyday living, mindfulness can be used regardless of one’s physical well-being. Given that MS patients experience a variety of physical limitations, training in principles and skills of mindfulness may be one alternative or additional health factor to be implemented for those that are hindered from interventions involving movement, such as physical exercise (Motl & McAuley, 2009). Thus, based on the current findings, we encourage future studies employing a randomized control trial design with an active control group to assess the role of mindfulness training on changes in emotion regulation and QoL in those with MS.

References


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