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Mindfulness and Relaxation: a Comparison of Brief, Laboratory-Based Interventions

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Abstract Mindfulness meditation has garnered increased interest as a treatment for a variety of psychological conditions, including anxiety. Due to its increasing popularity and the lack of research comparing it with previously validated treatments, this project compares brief, laboratory-based mindfulness meditation and progressive muscle relaxation (PMR) interventions. These interventions were examined in relation to facets of state mindfulness, mood, and state anxiety, with particular emphasis on how gender differences moderate these outcomes. Undergraduate students were recruited and randomly assigned to either a mindfulness intervention or a relaxation intervention. Across conditions, participants reported significant reductions in both negative affect and positive affect, while those in the PMR group reported significant changes in cognitive anxiety and women in the PMR group reported significant changes in somatic anxiety. These results differ from those of previous studies, which could indicate that mindfulness and relaxation exercises may influence men and women differently when cognitive or somatic symptoms of anxiety are more predominant in the present moment. Additional applications of mindfulness and further directions for research are discussed.

Keywords Mindfulness · Relaxation · Intervention · Anxiety · Affect · Gender

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Introduction

Psychotherapies based on mindfulness meditation, a Buddhist-based practice emphasizing non-judging and non-reactive acceptance of present thoughts and experiences, have garnered increased interest in recent years as a viable treatment option for a variety of psychological conditions (e.g., Hofmann, Sawyer, Witt, & Oh, 2010; Kabat-Zinn, 1990; Roemer, Erisman, & Orsillo, 2009; Segal, Williams, & Teasdale, 2002; Vøllestad, Nielsen, & Nielsen, 2012). Much of this interest is a result of theoretical and empirical work, which suggested that mindfulness-based meditation practices and therapies may reduce experiences relevant to anxiety, such as experiential avoidance and physiological over-reactivity (Kabat-Zinn, 2003; Miller, Fletcher, & Kabat-Zinn, 1995; see Roemer & Orsillo, 2002 for a review of this early work). More recent findings provide additional support for this idea, indicating that mindfulness is negatively correlated with worry and anxiety-related constructs, such as negative judgment of experiences and rumination on negative thoughts (Evans & Segerstrom, 2011). Early studies suggest that subjects completing multiple sessions of mindful practice over several weeks experienced reductions in anxiety (Kim et al., 2009; Lee et al., 2007). While promising, additional work is necessary to examine how these practices compare with previously established anxiety interventions.

A number of researchers have evaluated the efficacy of mindfulness-based interventions relative to previously validated techniques (e.g., Baer, 2003; Zautra et al., 2008). Relaxation-based treatments are commonly used as control comparisons, as relaxation has consistently been shown to effectively reduce anxiety (Jain et al., 2007; Rausch, Gramling, & Auerbach, 2006). These direct comparisons are essential, as new interventions should either demonstrate improved efficacy over previously established interventions or

demonstrate that they are more effective in certain subgroups of individuals (Chambless & Ollendick, 2001).

A recent example of this line of study examined the effects of a 15-minute mindful breathing (MB) task and two comparison conditions, progressive muscle relaxation (PMR) and loving kindness meditation on mood and state mindfulness (Feldman, Greeson, & Senville, 2010). Results indicated that those in the MB condition demonstrated higher scores on the decentering subscale of the Toronto Mindfulness Scale (TMS), which measures the unattached and non-judgmental viewing of thoughts, relative to the other conditions. The results further indicated that, while those in the MB group reported a higher frequency of repetitive thoughts than those in the comparison conditions, there was a significantly smaller correlation in this group between repetitive thoughts and negative reactions to these thoughts. The authors interpreted these findings to indicate that decentering had occurred as repetitive thoughts and one's reaction to those thought had become "unlinked" (Feldman et al., 2010).

Johnson, Gur, David, and Currier (2015) reported the results of a similar study in which they compared a single 25-minute session of mindfulness with a sham meditation session (which involved instructions to sit in silence and take deep breaths) and a no-treatment control. The aim of the project was to examine the effects of those various interventions on mood, state mindfulness, and anxiety. Consistent with Feldman et al. (2010), those in the mindfulness condition reported significantly higher levels of decentering immediately after the interventions. Additionally, those who completed the mindfulness intervention and sham session demonstrated significantly larger reductions in tension, anger, fatigue, and confusion in comparison with those in the control group, which showed no significant reductions. They also found no difference in anxiety, as measured by the State-Anxiety Inventory, between the mindfulness group and the sham meditation group. While providing some support for the utility of a mindfulness intervention, the study was limited in that it did not utilize previously supported stress-management techniques for comparison.

Expanding this line of work, Villa and Hilt (2014) examined the influence of participant gender as a moderator of outcomes related to mindfulness and relaxation tasks. As has been previously noted in the literature (Bekker & van Mens-Verhulst, 2007), participant gender is often overlooked within anxiety treatment outcome studies. In Villa and Hilt's study, participants were randomly assigned to one of three 8-minute interventions: mindfulness, PMR, or a no-treatment control. Before the interventions were administered, participants were instructed by the experimenters to recall a negative experience in their past in order to induce negative mood and were then given prompts to induce rumination on this negative experience. The results suggested that a brief instruction in mindfulness was associated with greater reductions in repetitive thoughts compared with a PMR exercise for female participants. In contrast, PMR was found to be more effective than the mindfulness intervention for male participants. Given these findings, it is clear that future work in this area must pay attention to possible gender differences.

The current study, therefore, tests the influence of a brief mindfulness exercise on state mindfulness, state anxiety, and mood relative to a comparison group completing progressive muscle relaxation. The goal of this study is to test whether mindfulness meditation provides additional benefits beyond a standard relaxation intervention with particular emphasis on how gender differences moderate these outcomes. We predict that those completing the mindfulness exercise will report higher levels of state mindfulness than those in the relaxation condition. Additionally, given previous findings examining the broader constructs of affect and anxiety, we predict that both groups will demonstrate a decrease in state anxiety and Negative Affect (NA) and an increase in Positive Affect (PA). Further, based on the study of Villa & Hilt (2014), we predict that the mindfulness intervention will have a greater effect on women compared with men in reducing anxiety as well as increasing positive mood and state mindfulness.

Method

Participants

Undergraduate students ($N = 194$; 64 % women) from a small, private, urban, Midwestern university were recruited for a study on "peaceful exercises and functioning." The majority of the sample self-reported as Caucasian ($n = 151$, 77.8 %); the rest of the sample reported their ethnicity as Asian American ($n = 17$, 8.8 %), African American ($n = 8$, 4.1 %), Hispanic ($n = 3$, 1.5 %), or "other" ($n = 15$, 7.7 %). The mean age of the sample was 19.03 ($SD = 1.25$). Participants received partial course credit (extra credit) in exchange for their participation.

Procedures

After completing the informed consent procedures, participants completed an initial set of self-report questionnaires including the State-Trait Inventory of Cognitive and Somatic Anxiety (STICSA) and the Positive and Negative Affect Schedule (PANAS), and a set of computer-based tasks not used in the current study (all participants are included in the current study, but some measures are not reported here). Participants were then randomized to one of two intervention groups: mindfulness ($n = 98$; 67 % female) or relaxation ($n = 96$; 62 % female). These interventions were each 15 minutes long (to control for length of intervention) and designed

to provide a relaxing environment for the participant. Participants in each condition listened to instructions via audio recordings, which were identical to those used by Feldman et al. (2010). Each intervention was narrated by the same person to control for tone and voice-related qualities. Participants listening to the mindfulness intervention were asked to observe their breathing and to notice when their mind wandered from the exercise. They were asked to do this in an accepting, non-judgmental manner and then return focus on their breathing, without trying to alter it. Participants in the relaxation condition were asked to develop slow and paced breathing and then to notice tension in their hands and arms and relax those muscles. They were then asked to repeat this with three other muscle groups in their body. Consistent with Feldman et al., the current study did not include the active tensing component of PMR to restrict physical movement in order to be consistent with the mindfulness condition. Both interventions included 12 minutes of guided instruction with 3 minutes of self-guided practice in silence at the end. These interventions are described in more detail by Feldman et al. (2010). Participants listened to the intervention via headphones in a private room (all participants completed these tasks individually). After completing the 15-minute intervention, participants completed a final set of measures (STICSA–state version, PANAS, and TMS) and were debriefed and credit for participation was granted by the research assistant.

Measures

Demographics Form This survey was used to collect information such as participants' age, gender, race/ethnicity, and marital/partner status.

Positive and Negative Affect Schedule The PANAS (Watson, Clark, & Tellegen, 1988) is a measure of general levels of positive and negative affect. Participants indicated on a Likert-style scale ranging from 1 (very slightly or not at all) to 5 (extremely) the extent to which they are experiencing both positive and negative feelings "right now." Results have demonstrated excellent convergent and discriminant validity with other measures of mood (Watson et al., 1988). The internal consistency for this study was high; Cronbach's α for PA was .91 pre-intervention and .91 post-intervention, while α for NA was .87 and .89, respectively.

State-Trait Inventory of Cognitive and Somatic Anxiety The STICSA–state version (Ree, French, MacLeod, & Locke, 2008) is a 21-item measure used to assess both the cognitive and somatic aspects of anxiety. While the measure also includes a trait form, given the aims of the study, we included only the state version in the current project. Participants were asked to rate each item on a Likert-style scale with response options ranging from 1 (almost never) to

4 (almost always) for both the cognitive subscale (e.g., "I think worse things will happen") and the somatic subscale (e.g., "My heart beats fast"). Participants were asked to answer each item based on "how you feel right now, at this very moment." Internal consistency for the current sample was high; Cronbach's α for the somatic scale was .87 and .87 (pre- and post-intervention). For the cognitive scale, α was .89 and .90, respectively. These findings are consistent with earlier work that provided support for the psychometrics of this measure (Gros, Simms, & Antony, 2010; Gros, Simms, Antony, & McGabe, 2007).

Toronto Mindfulness Scale The TMS (Lau et al., 2006) is a 13-item measure used to assess state mindfulness following a mindfulness-based exercise. Participants were asked to respond to questions related to their experience on a 4-point Likert-style scale from 0 (not at all) to 4 (very much). The measure comprises two subscales: decentering (awareness of one's experience with some distance) and curiosity (awareness of one's experience with genuine interest). The factor structure of the TMS has been previously supported and the measure has shown convergent validity with other common measures of mindfulness (Lau et al., 2006). The internal consistency for the current sample was high, with Cronbach's α of .92 for the curiosity subscale and .85 for the decentering subscale.

Data Analyses

An initial set of univariate ANOVAs were used to test for group and gender differences on state mindfulness using the Toronto Mindfulness Scale. Because this measure is designed to be used after an intervention, it was only administered during the "post" phase of data collection. For all significant interactions, we ran follow-up analyses examining the simple main effects.

To test the effect of intervention and gender on the outcome variables of interest, a series of repeated measures ANOVAs were examined with time (pre- and post-intervention) as the within-subject variable and group (mindfulness or relaxation) and gender (female or male) as the between-subject factors. The variables tested pre- and post-intervention were cognitive and somatic anxiety (from the state version of the STICSA) and positive and negative moods (from the PANAS). A significant group by time interaction would indicate that participants responded differently based on the intervention to which they were assigned. To further examine the role of participant gender, we also tested for significant time by group by gender interactions. For any significant interactions, we ran follow-up analyses examining the simple main effects.

Results

Means and standard deviations for all measures are presented in Table 1, and correlations (by gender) for all measures are presented in Table 2. First, we examined differences in state mindfulness by group and gender using two univariate ANOVAs. Results for the curiosity subscale of the TMS did not support the hypothesized interaction between group and gender, $F(1, 186) = 2.345$, $p = .127$, nor was there a main effect for gender, $F(1, 186) = .357$, $p = .551$. However, there was a significant main effect for group, $F(1, 186) = 4.822$, $p = .029$, partial eta squared $= .025$ with those in the relaxation group reporting less curiosity (estimated marginal mean $= 12.40$) than those in the mindfulness group (estimated marginal mean $= 14.28$). These analyses were repeated for the decentering subscale of the TMS, but neither the interaction of group and gender, $F = .947$, nor the main effects of group, $F = 2.009$, nor gender, $F = .802$, were significant.

Next, we examined subscales of the STICSA using repeated measures ANOVA as described above. For the cognitive anxiety subscale, there was a significant main effect for time, $F(1, 184) = 55.221$, $p < .001$, with a significant drop in cognitive anxiety from pre-intervention ($M = 18.42$, $SD = 6.61$) to post-intervention ($M = 15.11$, $SD = 5.85$) across intervention groups. Paired sample t tests indicated the change was significant in both the PMR, $t(94) = 7.858$, $p < .001$, and the mindfulness group, $t(94) = 4.022$, $p < .001$. However, this was qualified by a significant time × condition interaction, $F(1, 184) = 3.862$, $p = .05$. Follow-up univariate analyses indicated no differences between the groups pre-intervention, $F < 1$; but a significant difference after the intervention, $F(1, 184) = 6.26$, $p = .013$, with lower cognitive anxiety in the relaxation group ($M = 13.86$) than those in the mindfulness group ($M = 16.06$). Thus, while both groups demonstrated a significant decrease in cognitive anxiety, this change was larger for those in the relaxation group.

This analysis was then repeated for the somatic anxiety subscale, which demonstrated a significant main effect for time, $F(1, 184) = 13.989$, $p < .001$, with a significant drop in somatic anxiety from pre-intervention ($M = 15.59$, $SD = 4.71$) to post-intervention ($M = 14.51$, $SD = 4.43$) across intervention groups. However, this was qualified by a three-way time × group × gender interaction, $F(1, 184) = 5.833$, $p = .017$. Given previous research that indicated that men and women may respond differently to different interventions, we examined this possibility using simple main effects. The results indicated a significant interaction between group and change over time for women, $F(1, 121) = 3.888$, $p = .05$, partial eta squared $= .031$, with women in the relaxation condition ($M = 13.966$) reporting significantly less somatic anxiety than women in the mindfulness condition ($M = 15.343$). A similar interaction between time and group in males was not significant, $F(1, 63) = 2.845$, $p = .096$, partial eta squared $= .043$),

even though men in the mindfulness condition showed a larger drop in somatic anxiety (mean change $= 1.70$) than those in the relaxation condition (mean change $= .32$). However, given the larger effect size for men than women, this may indicate that the male sample was simply underpowered to detect differences in the current study.

A similar set of analyses was then conducted using positive and negative affect as the dependent variables. No significant interactions emerged in either set of analyses. However, there was a significant main effect for time for both positive affect, $F(1, 186) = 27.283$, $p < .001$, and negative affect, $F(1, 186) = 45.135$, $p < .001$. Across groups, negative affect decreased from pre-intervention ($M = 15.41$, $SD = 5.62$) to post-intervention ($M = 12.93$, $SD = 4.52$). Interestingly, positive affect also decreased from pre-intervention ($M = 24.85$, $SD = 8.72$) to post-intervention ($M = 21.98$, $SD = 8.37$).

Discussion

Baer (2003) proposed that mindfulness-based practices may have additional benefits in reducing anxiety and improving affect when compared with other psychological interventions, yet previous findings have not fully supported this assertion when assessed in laboratory settings (Feldman et al., 2010; Johnson et al., 2015). The aim of the current project, therefore, was to evaluate the efficacy of a brief mindfulness exercise on levels of self-reported state mindfulness, anxiety, and mood compared with that of PMR. In addition, given evidence that suggested outcomes related to mindfulness tasks might be strongly influenced by gender (Villa & Hilt, 2014), a particular emphasis was placed on the moderating potential of participant gender on the relationship between task and outcome variables.

In an initial evaluation of group differences, we found that those in the mindfulness condition reported significantly higher levels of curiosity on the TMS subscale, but a nonsignificant difference on the decentering subscale. This evidence adds support for the validity of the mindfulness intervention utilized in the study and suggests that this task produced unique outcomes relative to PMR. These results are partially consistent with those of Johnson et al. (2015), who reported higher levels of decentering and curiosity for those participants who completed mindfulness meditation compared with those who participated in a book-listening task and higher scores on curiosity for those in the sham meditation than those in a listening task. However, these findings contrast with those of an earlier work (Feldman et al. 2010), which found that participants in the mindfulness condition reported significantly higher levels of decentering than those assigned to the relaxation task and no differences in the reported levels of curiosity. This contradiction is particularly important since the procedure of the current study utilized the same audio

Table 1 Means and standard deviations by group and gender

	Mindfulness group			Relaxation group		
	Men	Women	Mindfulness total	Men	Women	Relaxation total
TMS–C	15.19 (4.87)	13.37 (5.85)	13.96 (5.59)	12.00 (5.10)	12.80 (5.92)	12.51 (5.62)
TMS–D	14.45 (5.23)	14.38 (5.55)	14.41 (5.42)	12.38 (5.09)	14.00 (6.25)	13.41 (5.88)
STICSACogT1	17.23 (6.44)	19.46 (6.90)	18.74 (6.81)	16.83 (5.62)	18.73 (6.69)	18.03 (6.36)
STICSACogT2	15.19 (6.59)	16.92 (6.99)	16.36 (6.87)	13.88 (4.48)	13.83 (4.16)	13.85 (4.26)
STICSASomaT1	15.68 (4.43)	15.75 (4.52)	15.73 (4.47)	14.66 (3.83)	15.87 (5.40)	15.42 (4.89)
STICSASomaT2	13.97 (3.37)	15.34 (5.23)	14.89 (4.73)	14.35 (5.42)	13.97 (4.12)	14.11 (4.08)
PANASNegT1	13.68 (3.40)	16.31 (6.42)	15.46 (5.74)	14.51 (5.42)	15.82 (5.55)	15.34 (5.11)
PANASNegT2	12.29 (4.12)	13.69 (5.23)	13.24 (4.92)	12.18 (2.97)	12.87 (4.59)	12.62 (4.08)
PANASPosT1	27.23 (9.76)	22.35 (8.17)	23.93 (8.96)	25.54 (7.18)	25.93 (9.07)	25.79 (8.38)
PANASPosT2	24.39 (8.60)	19.75 (7.13)	21.25 (7.90)	24.03 (9.16)	21.98 (8.57)	22.72 (8.80)

TMS–C Toronto Mindfulness Scale–curiosity, *TMS–D* Toronto Mindfulness Scale–decentering, *STICSA* State-Trait Inventory of Cognitive and Somatic Anxiety, *PANASNeg* negative affect from the Positive and Negative Affect Schedule, *PANASPos* positive affect from the Positive and Negative Affect Schedule

tracks as the Feldman et al. (2010) study to administer both the mindfulness and relaxation tasks. The examination of potential mediating variables that might account for this distinction goes beyond the scope of this study, but will be important to examine in future studies.

Addressing the primary aim of the study, the data also indicated that participants in both conditions reported significant reductions in cognitive anxiety and women in the PMR condition reported reduced somatic symptoms of anxiety. Across conditions, we found decreases in negative affect and positive affect across both conditions. With the exception of somatic anxiety symptoms, none of these changes were significantly influenced by participant gender. These results partially support the current study's hypotheses in that negative

affect and cognitive anxiety decreased for participants in both the meditation and PMR conditions as expected. However, post hoc analyses indicate that, although cognitive anxiety reduced in both groups, symptoms were significantly lower for individuals following the relaxation task compared with those for individuals in the mindfulness condition. One possible reason for this finding is that those in the mindfulness condition were told to observe/recognize their thoughts, while those in PMR were not. As a result, these directions may have increased awareness of cognitive anxiety in the short term for meditation-naïve participants. These findings indicate that more work is needed to better understand under which conditions and with which individuals might PMR or mindfulness be more successful.

Table 2 Correlations of all variables split by gender

	1	2	3	4	5	6	7	8	9	10
1. TMS–C	–	.811	−.045	−.137	−.088	−.066	−.028	−.091	.324	.379
2. TMS–D	.747	–	−.125	−.268	−.165	−.168	−.107	−.171	.314	.288
3. STICSACogT1	.283	.245	–	.710	.616	.467	.626	.374	−.138	−.103
4. STICSACogT2	.254	.170	.395	–	.611	.682	.622	.681	−.119	.013
5. STICSASomaT1	.335	.234	.607	.283	–	.723	.670	.603	−.056	−.011
6. STICSASomaT2	.350	.214	.575	.276	.641	–	.534	.744	−.036	.005
7. PANASNegT1	.318	.179	.536	.272	.546	.575	–	.683	.061	.117
8. PANASNegT2	.105	−.001	.356	.314	.205	.313	.648	–	.074	.240
9. PANASPosT1	.372	.251	.108	.031	.321	.164	.376	.394	–	.693
10. PANASPosT2	.260	.270	−.100	.032	−101	−.212	.018	.308	.661	

Italic correlations are significant at $p < .05$. Correlations for men ($n = 68$) are below the midline of the table, while correlations for women ($n = 126$) are above the midline

TMS–C Toronto Mindfulness Scale–curiosity, *TMS–D* Toronto Mindfulness Scale–decentering, *STICSA* State-Trait Inventory of Cognitive and Somatic Anxiety, *PANASNeg* negative affect from the Positive and Negative Affect Schedule, *PANASPos* positive affect from the Positive and Negative Affect Schedule, *T1* indicates measure was collected pre-intervention and *T2* indicates measure was collected post-intervention

Furthermore, inconsistent with predictions, both tasks led to self-reported decreases in positive affect. This reduction contrasts with previously reported outcomes that suggest that brief mindfulness tasks are associated with elevations in positive affect pre- to post-meditation (Jislin-Goldberg, Tanay, & Bernstein, 2012), but it is consistent with other studies that reported significant reductions in positive affect for meditation-naïve participants following a laboratory-based intervention (Thompson & Waltz, 2007). One possible explanation for this finding is that participants experienced mild discomfort due to lack of familiarity with either mindfulness or structured relaxation tasks. These findings may suggest that 15-minute tasks may not be a long enough period to develop comfort with either activity and, therefore, may result in a muted affect. Clinically, this outcome would be important to note as clients may benefit from psycho-educational information regarding these interventions and additional support may potentially help when completing their first mindfulness or relaxation exercise to manage discomfort. Another methodological explanation for this finding is that the PA scale of the PANAS focused primarily on the activation-related aspects of the construct. That is, it included terms that one might experience when energized such as *active*, *enthusiastic*, and *determined*, but fails to capture more peaceful or calm facets of the construct. This explanation is bolstered by the fact that positive affect decreased in both conditions, which suggests that these interventions may simply have "reduced the intensity of feelings" as opposed to truly reducing the experience of positive mood (Thompson & Waltz, 2007:1884). Additional research with measures that better capture feelings of peace, calmness, and contentment of affect is necessary to better clarify the relationship between laboratory-based stress-management techniques and changes in mood.

Although participant gender did not influence cognitive anxiety symptoms or mood, it did moderate the relationship between intervention and changes in somatic symptoms of anxiety. In the present study, women in the PMR condition reported significantly greater reductions in the physical symptoms of anxiety compared with those assigned to mindfulness meditation. An opposite, though non-significant, trend was reported for the male sample, as men within the mindfulness condition presented a greater decrease in somatic symptoms associated with anxiety than those assigned to the PMR condition. Effect sizes for the change in somatic anxiety symptoms for both male and female samples, however, were comparable, suggesting that the analyses of the male sample may have been non-significant due to lack of statistical power.

Interestingly, the findings of the current study varied from those presented by Villa and Hilt (2014) in that both tasks led to similar levels of improvement in cognitive symptoms of anxiety, which would include rumination, regardless of participants' gender. Furthermore, participants' gender in the present sample influenced reductions in somatic anxiety in a trend

opposite to that reported by Villa and Hilt, with PMR being more effective for female participants. These variations may be due to methodological differences in the two studies, as Villa and Hilt induced both negative mood and rumination prior to completing the meditation or relaxation tasks. As such, mindfulness and relaxation exercises may influence men and women differently when cognitive or somatic symptoms of anxiety are more predominant in the present moment. For example, mindfulness may be more effective for women experiencing greater cognitive anxiety, whereas women experiencing greater somatic anxiety may benefit more from PMR. Additional investigation should explore this potential interaction in order to better understand the impact of mindfulness- and relaxation-based exercises on both cognitive and somatic symptoms of anxiety for both men and women to help elucidate for whom each intervention is most efficacious.

The present study contributes to the growing body of literature evaluating the efficacy of mindfulness-based activities by experimentally comparing it to a previously validated clinical exercise and analyzing the outcomes with respect to gender. The mindfulness meditation condition improved in a similar fashion as the PMR group, suggesting that it is an effective exercise to target anxiety and mood symptoms even though PMR may be superior when addressing cognitive symptoms of anxiety. With respect to gender differences, the present study indicated that both activities influence symptoms equally regardless of gender, with the exception of somatic symptoms of anxiety. Given that the latter findings contradict those of previously published studies (Villa & Hilt, 2014), clinicians are encouraged to track changes in cognitive and somatic symptoms of anxiety when utilizing either task with patients to ensure both domains are being targeted appropriately.

The present study is strengthened by its experimental design, which allowed for the direct comparison of mindfulness meditation and PMR. Controlled comparisons are necessary when examining mindfulness-based exercises to ensure that they demonstrate similar or greater efficacy for individuals (Chambless & Ollendick, 2001), and the present study contributes to this important task. Additionally, the project was strengthened by its use of the mindfulness and PMR audio recordings utilized by Feldman et al. (2010), which increased the ability to compare results across studies due to the consistency of methodology and sample size (although their sample consisted of only female participants).

The current study, however, is limited by its use of a nonclinical undergraduate sample, which consisted of a generally homogeneous group. Although mindfulness has been used increasingly in collegiate settings (Shapiro, Brown, & Astin, 2011), further work in clinical settings is necessary to establish the generalizability of these results. The inclusion of a no-intervention control group would have allowed us to examine if the reductions reported above were due to the interventions

or simply a function of time or regression to the mean. Furthermore, the use of self-report across all variables limits the present findings. Future investigations would benefit from diversifying the methods of data collection to include a wider range of assessments of anxiety and mood.

Expanding upon the current study, future investigations should continue to examine when and how mindfulness mediation leads to increases in curiosity and decentering and whether these factors lead to diverse outcomes for clients experiencing anxiety and mood symptoms. Furthermore, future studies should evaluate both the immediate and longitudinal impacts of brief mindfulness- and relaxation-based tasks on symptoms of anxiety and mood, as well as potential mechanisms that may influence their respective outcomes such as openness to meditation or previous experience with either task. Specifically, replications of these experimental studies should be conducted to clarify the moderating impact of individuals' gender on changes in symptoms of anxiety when completing both types of activities. Together these future avenues of inquiry would help to elucidate how each of these tasks influences anxiety and mood as well as who benefits from each. This may help provide guidance to clinicians as they select mindfulness or relaxation exercises for clients.

In conclusion, the present study suggests that both brief mindfulness meditation and PMR are effective strategies for reducing the cognitive and somatic symptoms of anxiety, as well as influencing affect. This study adds support to the efficacy of both mindfulness- and relaxation-based exercises for anxiety and mood symptoms, although variations from previously published studies suggest that further investigation is needed to understand the direct effect and causal mechanisms associated with these interventions. Future investigations should focus on clarifying the immediate influence of gender on outcomes related to anxiety and mood, as well as expounding on the longitudinal effects of both mindfulness- and relaxation-based tasks to gain a better insight into how and for whom each exercise is most efficacious.

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