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Mindfulness Based Stress Reduction for Academic Evaluation Anxiety: A Naturalistic Longitudinal Study

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ABSTRACT

Mindfulness based stress reduction (MBSR) for academic evaluation anxiety and self-confidence in 70 help-seeking bachelor's and master's students was examined. A repeated measures analysis of covariance on the 46 students who completed pretreatment and posttreatment measures (median age = 24 years, 83% women) showed that evaluation anxiety and self-confidence improved. A growth curve analysis with all 70 original participants showed reductions in both cognitive and emotional components of evaluation anxiety, and that reduction continued postintervention. Although more research is needed, this study indicates that MBSR may reduce evaluation anxiety.

KEYWORDS

College students; evaluation anxiety; mindfulness; mindfulness based stress reduction (MBSR); test anxiety

There is growing concern about the impact of stress and mental health problems among students in higher education. International studies describe an increase in stress and symptoms of mental disorders among undergraduate and graduate students (Hunt & Eisenberg, 2010; Pinder-Amaker, 2012; Stallman, 2010). The increased psychosocial stress reported by university populations may negatively affect the quality of life, mental health, and academic performance of undergraduate and graduate students (Regehr, Glancy, & Pitts, 2013; Robotham & Julian, 2006). Bland, Melton, Welle, and Bigham (2012) suggest that college students often use maladaptive coping strategies and lifestyle habits that may serve to exacerbate the effects of academic stress, and that there is a need for interventions that promote more adaptive forms of coping with stress among college and university student populations.

Evaluations, a common area of stress for students, are an inevitable part of student life. Exams may provide academic recognition and prospective career opportunities, but may also represent a threatening situation. The ability to undergo evaluations without debilitating anxiety is crucial for students' well-being, self-confidence, and performance, and may prevent dropout. This naturalistic study examined whether Mindfulness Based Stress Reduction

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(MBSR) can be implemented in academic contexts to reduce evaluation anxiety and promote increased self-confidence in bachelor's and master's students.

Mindfulness involves “paying attention on purpose, in the present moment, and nonjudgmentally, to the unfolding of experience moment by moment” (Kabat-Zinn, 2003, p. 145). The Buddhist practice of mindfulness meditation was originally developed in an Asian culture that emphasized the value of *being*, of nonstriving and acceptance of experience, in contrast to contemporary Western cultures, which have been described as valuing *doing*, seeking individual achievement through competitive efforts and high performance (Stewart, 1972). There is evidence for MBSR as an effective intervention for anxiety disorders in general (Vøllestad, Nielsen, & Nielsen, 2012), and anxiety in academic samples specifically (Regehr et al., 2013). However, to our knowledge, no prior study has examined whether MBSR can be implemented specifically to reduce academic evaluation anxiety and promote increased self-confidence in academic student samples, and whether any benefits continue or even increase after the intervention.

MBSR was originally developed for patients with somatic illnesses who, perhaps out of necessity because of their medical condition, had the time and motivation to commit to making major lifestyle changes to improve their health and well-being. University and college students, on the other hand, live in a social context that expects efficiency, productivity, competitiveness, and individual accomplishments, and that measures and provides incentives for these achievements. This raises the question of whether a mindfulness-based stress reduction program could be relevant in such a context.

As psychologists, we work with students suffering from serious evaluation anxiety related to exams. Intensely hoping to avoid failure, students may have low self-confidence regarding their chances of doing well. Some may try to avoid reminders of the exam while having this knowledge haunt them. For some, academic evaluation anxiety takes on phobic proportions, so that merely opening a relevant book is avoided. Close to exams, some anxious students may study around the clock without being able to absorb what they are reading due to intruding anxious thoughts. On the day of the exam, physiological symptoms such as gastrointestinal problems and dizziness may prevent students from leaving home for the examination. Months and years after the exam, students may have distressing and self-derogative ruminations about their perceived negative performance on past evaluations.

Academic evaluation anxiety

Academic evaluation anxiety could include evaluation anxiety, test anxiety, academic performance anxiety, and exam anxiety. This concept has traditionally been termed test anxiety and constructed to contain two broad

dimensions: worry and emotionality (e.g., Zeidner, 1998). The worry component includes negative expectations and intrusive cognitions that may interfere with the exam. The emotionality component refers to perceived heightened physiological responses, for example, tension, rapid heartbeat, nausea, perspiration, and trembling. Prior studies indicate that the emotionality component may not disturb performance in and of itself, at least not in nonclinical samples (e.g., Morris & Liebert, 1970). However, when the physiological reactions accompanying emotions are so pronounced that they draw attention from the task at hand, this may reduce performance (Wine, 1971).

There are several proposed mechanisms that may be involved in academic evaluation anxiety. Attentional bias to danger characterizes anxiety-prone individuals in general (e.g., Tortella-Feliu et al., 2014). Signals of perceived threat may come from within the person or from the surroundings. Within the person, examples of danger signals may be thoughts (“I am doing poorly”), or bodily signals such as a rapid heartbeat or trembling. Gathering and directing one’s attention toward the task of the exam, and becoming absorbed by this more neutral task, becomes more difficult as a result (Eysenck, Derakshan, Santos, & Calvo, 2007). The individual’s attention may be directed at the possibility of a harmful outcome, for example, the risk of a humiliating experience or a failing grade, and behavior may be directed at avoiding this harmful outcome rather than understanding and learning the academic material.

Another general aspect of anxious individuals is difficulty in inhibiting automatic reactions (Eysenck et al., 2007), such as ruminating on one’s own shortcomings or studying in pressured and inefficient manners. Anxious students report that they try to cram everything in at once, reading without understanding or pauses, until they are exhausted and convinced, once more, that studying is of no use since they can remember nothing at all.

The general tendency to attend quickly and automatically to perceived danger is not in itself dysfunctional. From an evolutionary perspective, ingrained and quick reactions such as noticing danger and hiding, fighting or fleeing are advantageous (e.g., Ohman & Mineka, 2001). However, when preparing for an academic evaluation this tendency for “fight or flight” on the basis of danger signals may prevent the student from using more advanced cognitive resources. Our fight or flight system is more suitable for handling physical threats rather than symbolic threats such as an exam.

As alluded to earlier, in addition to the effects of strong anxiety on *attention* (pertinent to the cognitive component of test anxiety), anxiety may also influence self-confidence and trigger *difficult emotions* (pertinent to the emotional component of test anxiety). Wine (1971) noted that self-depreciatory thoughts often accompany evaluation anxiety. Low confidence in one’s ability to live up to expectations may increase the perceived danger

of evaluations, and self-depreciatory inner talk may draw attention away from the task and negatively affect mood. Early studies showed that test-anxious individuals, to a greater degree than their nonanxious counterparts, expected to fail (Trapp & Kausler, 1958), blamed themselves for failures on tests in a laboratory study (Doris & Sarason, 1955), and made task-irrelevant self-evaluative and apologetic comments during laboratory tasks (Ganzer, 1968). A more recent study showed that increasing the confidence of test-anxious teenagers via a priming intervention mitigated the negative effects of test anxiety (Lang & Lang, 2010). In that study, subjects were asked to imagine the thoughts and feelings that a person very successful in solving technical and scientific problems would have immediately before approaching a complex task. High test-anxious (but not low test-anxious) students showed higher performance on a cognitive test after this priming. This indicates that interventions aimed at increasing the self-confidence of test-anxious students might reduce the negative effects on performance. Accordingly, the first aim of the present study was to test the hypothesis that participating in a MBSR intervention would decrease anxiety and increase confidence in test-anxious students.

Why MBSR for evaluation anxiety?

There are several reasons that MBSR may be suited to treating evaluation anxiety. First, there are reasons to expect that MBSR will improve cognitive components of evaluation anxiety, for example by reducing the usurpation of attention by worry and intrusive thoughts. Mindfulness exercises (and discussing such exercises in the MBSR groups) may help students to learn about the tendency for the mind to wander away from a chosen target and to define this as a common human “default mode of processing.” In other words, mind wandering need not be a problem if one is able to recognize it as such and redirect attention at will. During mindfulness exercises, whenever their minds wander, students are asked to redirect their attention back to the breath or to some other “anchor” in present moment awareness. Students’ goals are changed from, “I must avoid mind wandering at all costs” to “it is normal for minds to wander, but I can redirect my attention to the present at will.”

There are also reasons to expect that mindfulness training can influence the emotional component of evaluation anxiety. Students often inform us that the relaxing effects of the body scan and other mindfulness practices are particularly useful, especially when first starting to learn mindfulness. The attention to the breath that is commonly used in mindfulness exercises will often trigger what Benson called the “relaxation response” (Lazar et al., 2000). Repeatedly redirecting attention to the breath when attention has been drawn toward anxious expectations may function as a graduated

exposure procedure, helping students habituate to emotions associated with exams. Over time, they learn that they can continue to function in spite of moments of strong emotions. Having access to such tools for emotion regulation—returning to the breath when anxious, accepting emotions as “events in the mind” rather than fighting them—may increase students’ confidence in their ability to cope with exams even when anxious.

After the exam, many evaluation-anxious students ruminate on errors made during the exam, even to the extent of feeling incapable, overall as individuals. Such negative self-judgments increase the risk for depressive symptoms, which may further increase evaluation anxiety. In contrast, acceptance of painful emotions and thoughts about having failed may be achieved via the same methods mentioned previously: nonjudgmental acceptance of such thoughts and feelings as “events in the mind” that are common to most humans, rather than reflections on one’s overall abilities or worth.

There are also nonspecific aspects of the MBSR program that makes the program suitable for students with academic performance anxiety. The program reframes anxiety as a normal reaction to stressful circumstances rather than a clinical condition. The group format may help students feel less alone and different. Also, studies suggest that mindfulness training may have lasting effects on a wide range of mental health outcomes (De Vibe, Bjørndal, Hammerstrøm, & Kowalski, 2012). Mindfulness is not intended as a tool that fixes uncomfortable emotions by removing them. Rather, it may enable a student to live with the anxiety of evaluations without these uncomfortable emotions taking over and disrupting performance. This ability to live and cope with anxiety may emerge gradually.

Hypotheses for the current study

Based on the seeming suitability of MBSR for ameliorating evaluation anxiety, we set out to teach MBSR to a group of students and assess its effect on evaluation anxiety. Our expectation was that this would cause evaluation anxiety to continue to decline even after termination of the MBSR intervention.

Our three hypotheses were:

- H1: Students taking part in a MBSR intervention will have statistically significantly higher anxiety and statistically significantly lower self-confidence than the non-help-seeking group at Time 1 and will show statistically significant decreases on anxiety and statistically significant increases on self-confidence-measures compared to the non-help-seeking group when accounting for age and failing exams at the senior high school level.

- H2: Participants in the MBSR intervention will show statistically significant decreases on both the emotionality and cognitive components of test anxiety.
- H3: Favorable changes in evaluation anxiety will continue after the intervention.

Method

Procedure

Five MBSR courses were held during a period of 2 years. Participants were self-selected via the Student Welfare Center and announcements on campus. Preintervention screening for contraindications (suicidal acts during the last year, current drug addiction, current psychosis, serious untreated bipolar disorder, serious current anorexia or interfering flashbacks) did not identify any participants to be excluded.

Six measures of anxiety and self-confidence were administered both at baseline and 3 days before their first postintervention exam approximately 3 months later (see instruments as follows). As a reminder to participants to complete the measures 3 days before their exam, individual text messages were sent out to the students' private cell phones.

According to Shadish, Cook, and Campbell (2002), research designs without control groups may be improved by contrasting the intervention groups to a relevant comparison group, for example, a normative comparison group of nonhelp-seeking individuals. A normative comparison group can help establish whether the treatment group differs from a nonhelp-seeking group on the outcome variables before any treatment is initiated, and whether the groups have become similar after treatment (Kendall, Marrs-Garcia, Nath, & Sheldrick, 1999). A study by Nietzel, Russell, Hemmings, and Gretter (1987) exemplifies the use of normative comparison groups. Nietzel and colleagues (1987) reviewed studies of adjustment of depressed individuals after therapy and examined the posttherapy similarity between these depressed individuals and normative comparison samples of nondepressed individuals. While not a randomized control group and for this reason not allowing causal explanations of postintervention group-differences, normative comparison groups may nevertheless be useful in order to understand what might be a typical score, or, as in the present study, a typical developmental trajectory, for a nonclinical population. This may be useful in deciding whether an intervention has promise and for this reason should be further studied.

Normative comparison samples should ideally be gathered from the same population as the treatment group, the timing of testing should be similar

over groups, and the normative samples and treatment samples should have similar maturational experiences (Shadish et al., 2002). In the present study, we used a group of nonhelp-seeking students from the same university and university-college as the help-seeking treatment group. These students were approached during a lecture and asked to complete measures (the same measures as the treatment group) at the beginning of the semester and again (on the Internet) 3 days before exams—the same time-points relative to exams as the intervention group.

In addition, longitudinal changes on test anxiety across seven time points were examined in the MBSR group only. Measurement time points for the longitudinal analysis were as follows. T1 = the introductory meeting scheduled 1 week before the formal start of the MBSR intervention; T2 = first day of the MBSR intervention; T3 = midway through the intervention; T4 = last day of the intervention; T5 = 3 days before the first exam scheduled after the intervention; T6 = approximately 1 week after this exam; and T7 = follow-up 0.5–2.5 years after. Since the original plan was to examine if follow-up use of mindfulness was related to time since the intervention ended, the follow-up questionnaires were systematically sent at 0.5 years, 1 year, 1.5 years, 2 years, and 2.5 years after the intervention. However, since 37 of the 40 respondents at the final follow-up were still using what they had learned during the course, regardless of how much time had elapsed since the intervention, this analysis was not carried out.

The intervention: Mindfulness-based stress reduction

The intervention followed the 8-week course designed for the MBSR program, and consisted of eight meetings and a day-long meditation class between meetings six and seven (Santorelli & Kabat-Zinn, 2009). Throughout the course, participants shared their experiences with the MBSR therapist and with each other. The program conveys how to practice mindfulness and provides opportunities to discuss experiences with inner and outer stress (e.g., feeling unable to cope with an upcoming evaluation, trembling, racing thoughts during an evaluation). In contrast to some cognitive behavior interventions, this intervention encourages students to let thoughts and feelings come and go without attempting to *change* them. They practice this awareness and “nonjudging” attitude during mindfulness practices. During the first four sessions, participants are gradually introduced to mindfulness practices such as mindful eating, the body scan, sitting meditation, and yoga. They receive audio recordings of the “formal” practices body scan, sitting meditation, and yoga, and also are asked to practice “informal” mindfulness practices in their everyday life, such as being nonjudgmentally aware of what they are experiencing from moment to moment while eating a meal or washing. Typical stress

responses and the effects of stress on the body are discussed throughout the course, especially during the fourth session. Suggestions are made that fighting stress responses is seldom an optimal solution. Participants discover through practice that by being mindfully aware of these human responses while using the breath as an “anchor” they can attend to the present even if anxious. Between the sixth and seventh sessions a whole day of practice is offered.

In the current study, four licenced clinical psychologists led the five groups, working in teams of two therapists (for three of the groups) or as a single therapist (for two groups). Each group had at least one therapist with a regular and long-term personal mindfulness practice who had attended formal MBSR training, including the “teacher intensive” training offered at the Center for Mindfulness at the University of Massachusetts.

Participants

Seventy potential MBSR participants (86% women) participated in the introductory meeting and were eligible for the course. Most participants (94%) were either bachelor’s or master’s students at a university or college and 6% attended other schools. Some (9%) reported that they had failed one or more exams during high school. Most (82%) were studying for written school exams.

Fifteen students of the original 70 students dropped out during the course (with dropout being defined as not being present to complete measures at the last day of the course or any of the later posttherapy measures). Noncompleters did not significantly differ in baseline measures from those who completed. Of those 55 students completing the course, 46 completed measures 3 days prior to their first exam after the intervention.

The comparison group comprised of 90 non-help-seeking students recruited from the same institutions as the intervention students, as part of a larger study on treatments for evaluation anxiety. These non-help-seeking students completed identical measures at two of the same time points as the intervention group (baseline and 3 days before exams). Treatment and comparison groups did not significantly differ according to gender or to failures in senior high school. In the treatment group, 80% were women and in the comparison group, 85.7% were women. Six individuals in the treatment group reported having failed at least one exam at senior high school, while three individuals in the comparison group reported having such experiences. Groups did significantly differ in age. In the comparison group, 95% of the participants were within the age range of 19–26 years, while in the intervention group, 70% were within this age range.

Measures

Revised test anxiety scale (RTA)

The RTA (Hagtvet & Benson, 1997) offers a 4-point rating scale from “almost never” to “almost always” (e.g., “I worry a great deal before taking an important exam”). RTA contains four subscales: Worry (6 items), Test-irrelevant thinking (4 items), Emotionality (5 items), and Bodily symptoms (5 items). When measuring the cognitive component of evaluation anxiety, the Worry and Test-irrelevant thinking subscales were combined. When measuring the emotionality component of evaluation anxiety, the Emotionality and Bodily symptoms subscales were combined. Otherwise the total RTA was used. The scale was translated into Norwegian for an earlier study, and an additional seven items were added to the original 20 items as part of that process (Dundas, Hagtvet, Wormnes, & Hauge, 2013). The reliability of the total RTA was .94 at baseline in the present study.

State and trait anxiety

The State and Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970) consists of two parts. On the 20-item state part, the respondent rates statements about how he or she is feeling at the moment on a 4-level scale ranging from “not at all,” to “very much so,” for example, “I feel upset.” On the 20-item trait part, the respondent indicates general feelings on a 4-level scale ranging from “almost never” to “almost always,” for example, “I am a steady person.” A Norwegian translation with acceptable psychometric properties was used (Håseth, Hagtvet, & Spielberger, 1990). In the current study, the reliability was good for both state anxiety (Chronbach’s alpha = .94) and trait anxiety (Chronbach’s alpha = .90).

Self-esteem (SE) and academic self-esteem (ASE)

Fourteen items from the Self-Description Questionnaire II (SDQ-II, Marsh, 1990), with response categories of “false,” “mostly false,” “mostly true,” “true,” were translated into Norwegian for a student level population by Skaalvik (1994). The first eight items measure general self-esteem, for example, “I wish I were a different person.” The remaining six items measure academic self-esteem, for example, “I do well on tests in my studies.” For the present study, internal reliabilities (Chronbach’s alpha) were .81 for general self-esteem and .79 for academic self-esteem.

General self-efficacy (GSE)

The GSE Scale (Jerusalem & Schwarzer, 1992) assesses respondents’ expectations of being able to successfully cope with situations in general. The respondent is asked to indicate how well each of 10 statements (e.g., “I am confident that I could deal efficiently with unexpected events”) applies at the

moment on a 4-level scale from “*not at all*” to “*exactly*.” Adequate internal consistency, stability estimates, and criteria-related validity has been demonstrated (Conner & Norman, 1996; Schwarzer, 1993). A Norwegian translation with acceptable psychometric properties (Skaret, Kvale, & Raadal, 2003) was used. In the current study, the internal reliability (Cronbach’s alpha) was .89.

Results

Changes for the MBSR group in anxiety and self-confidence

Our first hypothesis concerned changes from baseline to the first postintervention exam on six anxiety- and self-confidence measures. As mentioned in the introduction, prior studies suggest that anxiety naturally increases close to exams. We expected that the intervention group’s anxiety would increase less (or even decline) toward exams, and that general self-esteem, academic self-esteem, and general self-efficacy would increase. We expected that these changes would make the help-seeking students close in scoring to the non-help-seeking group after the intervention.

To examine this hypothesis, mean changes from baseline (T1) to 3 days prior to the first exam scheduled after the intervention (T5) were compared with mean changes in a similar time period for the non-help-seeking comparison group, using a repeated measure Analysis of Covariance with the variables Gender and Group (MBSR vs. normative comparison) as between-subjects factors. Age and failing exams at senior high school level were entered as covariates. Each of the three anxiety measures and three self-confidence measures were examined separately. When significant interactions were observed, the nature of these interactions was examined with tests of marginal means (adjusted to $p < .004$ for multiple comparisons when differences were hypothesized to exist, but not adjusted when differences were hypothesized to be absent). In these analyses, only the 46 MBSR participants and 90 normative comparison participants who had returned their questionnaires 3 days before exams were included.

Table 1 shows means for each group on each outcome variable at baseline (T1) and 3 days before their exams (T5), and interaction-effects (group by time).

The group by time interaction was significant for all outcome measures except academic self-esteem, suggesting that the groups changed differently toward exams. Exploring the nature of these five significant interactions with tests of marginal means showed that, at baseline, the MBSR group had significantly higher evaluation-anxiety, trait-anxiety, and state-anxiety, and lower self-esteem than the normative comparison group. For general self-efficacy no baseline group difference was found. The MBSR group decreased consistently in evaluation anxiety and trait anxiety from baseline to 3 days

Table 1. Pre-intervention and Post-intervention Means And Interactions for Intervention and Comparison Groups on Anxiety and Self-Confidence Measures.

| | Intervention M^a ($N = 46$) | | Comparison M^a ($N = 90$) | | Group * Time | Effect size (η^2) for Change in Intervention Group ^b |
|----------------------|------------------------------------|------------|----------------------------------|------------|-------------------------------|---|
| | Pre | Post | Pre | Post | | |
| Evaluation anxiety | 2.43 (.10) | 2.14 (.11) | 1.81 (.06) | 1.89 (.07) | $F(1, 128) = 13.86, p < .001$ | .27 |
| Trait anxiety | 2.70 (.09) | 2.44 (.10) | 1.93 (.06) | 1.91 (.07) | $F(1, 127) = 5.93, p = .016$ | .25 |
| State anxiety | 2.34 (.10) | 2.33 (.13) | 1.72 (.07) | 2.14 (.08) | $F(1, 126) = 7.92, p = .006$ | .001 |
| Self-esteem | 2.59 (.13) | 2.93 (.12) | 3.16 (.08) | 3.20 (.08) | $F(1, 128) = 6.46, p = .012$ | .21 |
| Academic self-esteem | 2.67 (.16) | 2.95 (.15) | 2.90 (.10) | 2.98 (.09) | $F(1, 128) = 3.45, p = .066$ | .18 |
| Self-efficacy | 2.40 (.11) | 2.68 (.11) | 2.67 (.07) | 2.65 (.07) | $F(1, 129) = 7.57, p = .007$ | .24 |

Note. Measures are taken at baseline and 3 days prior to each student's first post-intervention exam.

^aMarginal means computed at the means of the covariates, with standard errors in brackets.

^bEffect sizes for change from baseline to 3 days before exams for the intervention group only. Covariates are not included in this latter analysis.

before exams, and showed no change in state anxiety at that time. In contrast, the normative comparison group did not change in evaluation anxiety or trait anxiety during this time period, and increased in state anxiety. Similarly, the intervention group increased in self-esteem and general self-efficacy, while the normative comparison group showed no change.

These same tests of marginal means also showed that, after the intervention, mean scores of the MBSR-group no longer differed significantly from the comparison group in four areas: evaluation anxiety, state anxiety, self-esteem, and general self-efficacy. For trait anxiety (which might be a more stable personality trait than the previous measures) the scores of the MBSR group, although significantly reduced 3 days before exams, did not reach the level of the non-help-seeking group. Throughout the analyses, no significant main or interaction effects were found for gender, age, or prior failed exams.

Additional analyses examining change from baseline to 3 days before exams for the intervention group only (no covariates included), showed that the favorable change for the intervention group was largest for evaluation anxiety ($\eta^2 = .27$); a little less for trait anxiety ($\eta^2 = .25$), self-esteem ($\eta^2 = .21$), and academic self-esteem ($\eta^2 = .18$); and least for state anxiety ($\eta^2 = .001$). Overall, the findings indicated that the MBSR group changed favorably both in anxiety and self-confidence, and was no longer significantly different than a non-help-seeking group on four outcome measures.

Longitudinal changes in evaluation anxiety

Our second hypothesis was that participants would experience favorable change both in the emotionality and the cognitive components of evaluation anxiety during and after the intervention. A latent growth curve analysis (Bollen & Curran, 2006) was chosen. Because a growth curve analysis can estimate trends in noncomplete data set due to multiple measurement time points, this analysis could be conducted on the full sample of 70 eligible MBSR students.

Generally, a growth curve describes how outcome changes over time, and individual variations around this general change. In the present study, the loading for the baseline measurement was fixed to 0 and the loading for the postintervention measurement coded at 1. This means that the mean of the slope component reflected the average change from baseline to postintervention. To accommodate nonlinear change after the postintervention measurement (because we wished to examine if change in evaluation anxiety *after* the intervention differed from change in evaluation anxiety *during* the intervention), the loading for the slope factor on the follow-up measurement was estimated freely, a procedure sometimes referred to as “stretching time” (Bollen & Curran, 2006). Because the analysis included two components of test anxiety (the cognitive and emotional components), a correlated-change model was used.

As expected, both the cognitive and emotional components of evaluation anxiety changed as a function of time. From the first day of the intervention to the last day of the intervention, the average decline was -0.28 units for the cognitive component ($t = 4.84, p < .001$), and -0.29 units for the emotional component ($t = 5.34, p < .001$). Using total baseline variance as the relevant metric for effect size, the standardized effect size (ES) for the average change from the first to the last day of the MBSR intervention was -0.44 *SD* for the cognitive component, and -0.49 *SD* for the emotional component. This showed that both the cognitive and the emotional components of evaluation anxiety were significantly reduced during the intervention, as was hypothesized. The correlation between change in cognition and change in emotion was $r = .60$. This indicated that individuals with the highest change in cognition also tended to have the strongest change in emotional symptoms.

Our third hypothesis was that this change in evaluation anxiety would continue after the intervention ended. The growth curve analysis supported this hypothesis. The fall in evaluation anxiety was more rapid during the intervention than afterwards. Three days prior to the exam scheduled after the intervention (T5), the mean change from the first day of the intervention was -0.32 ($t = 5.13, p < .001, ES = -0.51$) for the cognitive component and -0.33 ($t = 6.31, p < .001, ES = -0.56$) for the emotional component. At the final follow-up (T7) the difference from the first day of the intervention was

−0.50 ($t = 5.51$, $p < .001$, $ES = -0.80$) for the cognitive component and −0.53 ($t = 6.64$, $p < .001$, $ES = -0.92$) for the emotional component. To summarize, not only did evaluation anxiety decline during the intervention, it continued to fall, albeit more slowly, after the intervention.

When receiving their final questionnaires by mail at follow-up, participants were asked to indicate whether they were still making use of anything they had learned during the intervention. Of the 40 participants who responded to this follow-up, 37 answered affirmatively.

Discussion

Our first hypothesis was that students in the treatment group would improve from baseline to 3 days before exams on both anxiety and self-confidence measures. This hypothesis was partially supported, with intervention students demonstrating reduced evaluation anxiety and trait anxiety, no change in state anxiety, and increased self-esteem and self-efficacy from baseline to 3 days before the first exam after the intervention. After the intervention, their levels of evaluation anxiety, state anxiety, self-esteem, and general self-efficacy no longer differed significantly from that of the normative comparison sample. The *trait* anxiety of the treatment group, although significantly reduced from baseline, remained higher than that of the non-help-seeking group. This is in agreement with prior studies that show that trait anxiety generally tends to be more stable than state anxiety across time (Newmark, 1972; Usala & Hertzog, 1991).

Our second hypothesis, that participants would experience favorable change both in the emotionality and the cognitive components of evaluation anxiety, was supported in the growth curve analysis. Third, we hypothesized that any favorable changes in evaluation anxiety would prevail at follow-up. Evaluation anxiety actually continued to fall after the MBSR intervention had ended. When asked at follow-up whether they still practiced “any of that which you learned during the course,” a majority of the students reported that they did.

In the introduction we raised the question of whether MBSR might be useful for evaluation anxiety in spite of the fact that MBSR promotes values of being versus doing. The value of “being” may seem to contrast with the efficiency expected of students. Mindfulness training may work by enabling an individual to flexibly move from a driven “doing” mode that focuses on the discrepancy of how things are and how one would like them to be (e.g., “I shouldn’t be anxious, I should know the answers”), to a “being mode” that allows what is presently the case, without trying to change it (e.g., “I am anxious, and I do not know all the answers, but I am still breathing, competent, and valuable”; Teasdale, 1999). The ability to balance “being” and “doing” may also be useful on a larger time scale, as it may help to

balance work with rest. Some students complain that they do not know when they should allow themselves to rest and when they should just keep on studying. Studying without pauses is likely to be counterproductive. Mindfulness training involves developing a greater sensitivity to bodily signals, both those of energy and those of fatigue. Students may be better at noticing when they still have energy and when they are actually exhausted and, as a result, strike a healthier balance between time used in studying and time used on other activities.

In many areas of academic work it is not only conscientious and driven diligence, but also creativity that is important. A rigid “doing” mode of studying may favor conformity and adherence to received knowledge rather than independent and creative thinking. The ability to let go of ideas about how things should be, and to relax one’s preconceptions, is characteristic of a less anxious and more equanimous “being” mode. A balance between “doing” and “being” may be necessary for the best academic results in many fields. Perhaps by reducing an anxious drive to avoid failure and by providing experiences of a more relaxed “being” mode, MBSR might increase students’ confidence in their abilities not only for remembering and reproducing certain facts, but also for creative thinking.

Finally, the ability to “be” rather than “do” may help students accept their “less than perfect” humanity, including a “less than perfect” present state of knowledge. In exams, there will frequently be questions that the student cannot answer. The ability to emotionally accept that they do not know certain answers may reorient students to their value as humans (who will, of course, never have perfect knowledge). The decrease in anxiety accompanying this acceptance may also, paradoxically, allow them easier access to knowledge that they actually do possess at the time of the exam. Rather than being a reason for anxiety, the ability to “not know” may be an inspiration to learn. A prior study indicated that meditation may reduce dysfunctional perfectionistic tendencies in undergraduate students (Burns, Lee, & Brown, 2011). Acceptance of imperfection may be sorely needed for conscientious students who are willing to strive hard toward academic perfection.

Limitations and strengths of this study

First, a lack of randomization procedures and control group limits our ability to draw causal inferences and generalize from our findings. We compared the changes in the MBSR group with changes in a nonhelp-seeking group (which naturally was less anxious and less eager for change at baseline than the MBSR group). This helps us understand how their changes compare to the way regular students commonly change toward exams. However, it might be that the initial differences between the groups, for example, that the MBSR group was more anxious initially or that they had decided to make a change,

were the real causes of the changes observed in that group. In order to establish causal effects, further studies with intervention and control groups that are identical at baseline are needed. The current study provides a preliminary indication of the possibility of a clinically relevant treatment effect of the MBSR intervention.

When sending out the follow-up questionnaires, we did not explicitly ask if students were still facing exams and if the exams they were currently facing were as serious as the ones they took immediately after the intervention. For these reasons, we could not control for the possibility that the reduction in anxiety followed from a reduction in challenging exams. Further, performance on exams was not measured, so the study cannot claim that the intervention favorably affected performance. We also did not measure the students' academic abilities or study skills. In Ergene's (2003) meta-analysis, interventions which combine skill-focused approaches with cognitive or behavior approaches were the most effective. Our impression was that our group consisted mainly of students who had the requisite academic and test-taking skills, but who were prevented from efficiently using these skills because of evaluation anxiety. The current results may not be generalizable to students who lack academic and test-taking skills. Finally, the finding that some students failed to complete the intervention indicates that MBSR is not suitable for all students.

The fact that we closely followed changes in evaluation anxiety over time and used multiple outcome variables, were two strengths of this study.

Implementing MBSR in a college setting

The findings in our study indicate that MBSR may be a useful intervention to consider for mental health counseling centers on campus, for college and graduate students struggling with academic evaluation anxiety and associated mental health problems. In our experience, recruiting participants via announcements on campus and the student welfare agency, in combination with a preintervention screening for any need for additional or alternative help, worked well. The tendency for some students to intermittently skip sessions may be a challenge. Extensive information about the content of the program, its rationale and its sometimes challenging and demanding character was provided at the beginning of the program, in order to build realistic expectations. Participants were given audio-recorded practices and booklets throughout the program (Santorelli & Kabat-Zinn, 2009) in order to guide practice between sessions. Discussions within sessions were guided toward experiences with mindfulness and recognizing the commonality of the difficulties in college life that were shared among participants. Participants typically noted that finding that others shared similar concerns as themselves was valuable. Posttreatment interviews indicated that the intervention was

experienced as useful and relevant for the concerns and presenting problems of college and university students (Hjeltnes, Binder, Moltu, & Dundas, 2015).

In conclusion, MBSR has been shown to be highly engaging for college students (Murphy, 2006) and existing research has documented the positive effects of MBSR on college students' mental health and stress (Regehr et al., 2013). To our knowledge, no prior studies have examined the effectiveness of MBSR on college students' confidence and academic evaluation anxiety. Our findings demonstrate that evaluation anxiety declined during the intervention and continued to decline beyond the time span of the 8-week intervention. These results suggest that mindfulness training may bring lasting change in both the cognitive and emotional processes associated with academic evaluation, and may be worth the time and effort involved.

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