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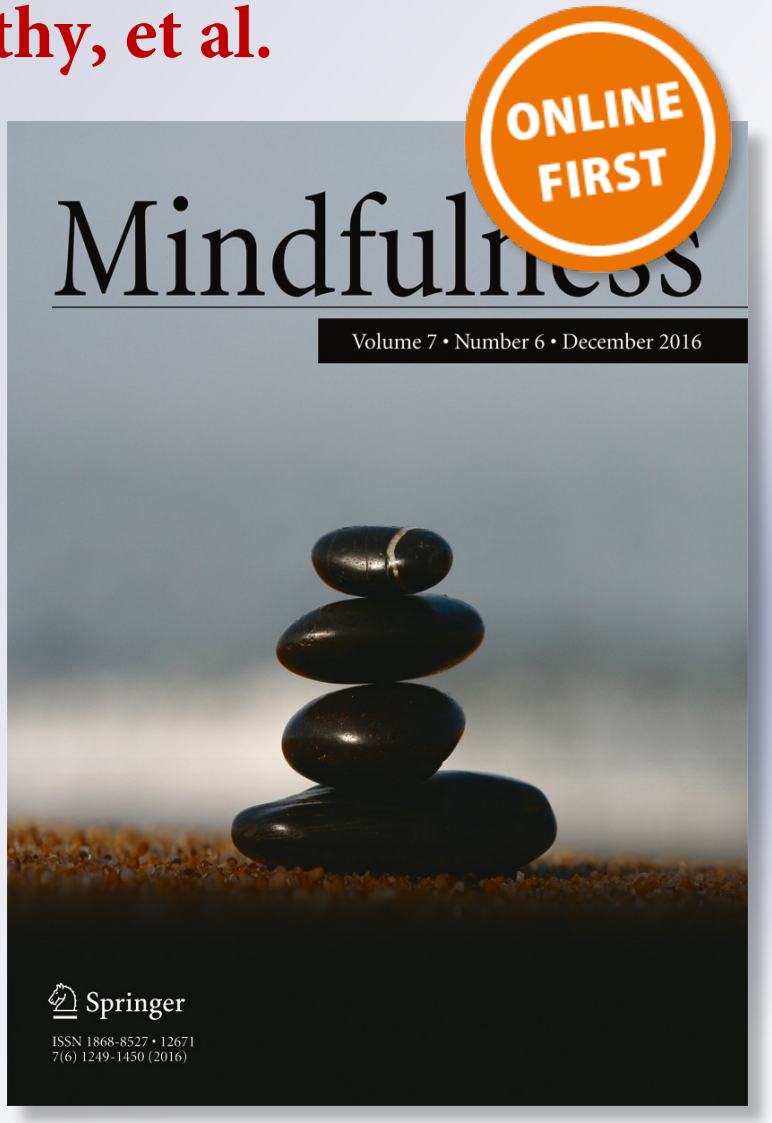

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ORIGINAL PAPER

Impact of a Tibetan Buddhist Meditation Course and Application of Related Modern Contemplative Practices on College Students' Psychological Well-being: a Pilot Study

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Abstract The intent of the current research was to explore the impact of a specific Tibetan Buddhist meditation course containing a lab for applied practice of modern techniques upon psychological well-being in college students. We evaluated the impact of a semester-long undergraduate Tibetan Buddhist meditation course on the psychological well-being of 205 students and assessed whether changes in well-being were mediated by mindfulness. The course was composed of two weekly lectures regarding the tradition and modern applications of meditation, respectively, and a weekly lab in which the students were taught a survey of related modern contemplative techniques to practice. Students were assessed at the beginning, middle, and end of the course, and their time spent practicing the exercises were prospectively recorded. Participants reported statistically significant increases in self-reported mindfulness, self-compassion, and positive coping and significant decreases in self-reported anxiety. Mindfulness was a significant predictor of changes in self-compassion and anxiety. These results suggest that a large lecture course with weekly meditation practice can have a positive impact on the psychological well-being of students and that some of these changes are mediated by mindfulness.

Keywords Mindfulness · College students · Well-being · Meditation · Buddhist

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Introduction

The impact of contemplative practices, including a variety of forms of meditation, has been explored in a wide range of clinical and non-clinical populations. This exploration has resulted in a growing body of research indicating that regular contemplative practices can have a variety of positive effects. Such meditative techniques have typically been taught in a treatment format with a focus on practice and engagement. These techniques generally have been found to be beneficial for health and well-being, with findings including increased immunity as assessed by significant increases in antibody titers to influenza vaccine, improved brain function as assessed by significant increases in left-sided anterior activation which is a pattern previously associated with positive affect, and social connectedness as evidenced by increased feelings of social connection and positivity toward novel individuals on both explicit and implicit levels in laboratory studies (Davidson et al. 2003; Hutcherson et al. 2008; Lazar et al. 2005).

Although mindfulness has also been defined and measured as a state or practice, in the present article, we examined mindfulness as a trait. Mindfulness has been defined as "non-elaborative, non-judgmental, present-centered awareness in which each thought, feeling, or sensation that arises in the attentional field is acknowledged and accepted as it is" (Bishop et al. 2004, p. 233). Western psychology has adapted and integrated the

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concept of mindfulness, with origins in Buddhist contemplative practices, into therapies such as mindfulness-based stress reduction (MBSR) (Kabat-Zinn 1990).

Due in part to these findings regarding the salubrious impact of contemplative practices upon mindfulness and psychological well-being, there is an increasing interest in the application of meditation techniques to secular settings, including education (Duerr 2004). Roth (2014) demonstrated that students who participated in 12 weeks of training in meditation-displayed improvements in attention and self-judgment, decreases in symptoms of self-reported depression and anxiety, and an increase in aspects of mindfulness, as assessed by the Mindful Attention Awareness Scale (MAAS) (Brown and Ryan 2003) and the Five Facet Mindfulness Questionnaire (Baer et al. 2008). Specifically, female students participated in a semester-long East Asian/Religious Studies course that incorporated "meditation laboratories" designed to allow students to experience the contemplative practices that they learned and read about during the didactic class periods. In addition to 2.5 h a week of didactic class time, participants met for an additional 3 h a week for meditation practice time. Meditation training included both Samatha and Vipassana forms of practice, which included focused awareness training on a single object (such as the breath) or a class of objects (such as body sensations) but did not include objectless meditation (open monitoring or choiceless awareness: Silverstein et al. 2011). Roth (2014) demonstrated that student participants in these "meditation laboratories" displayed significantly increased memory on a standardized word recall task for positively valenced stimuli when compared with an active control conditions. This change in emotional information processing was associated with improvements in psychological well-being and less depression and anxiety as measured by the Scales of Psychological Well-Being (Ryff and Keyes 1995) and the mood and anxiety symptom questionnaire (Watson et al. 1988).

Others have studied the impact of meditation interventions on college students, but most prior studies have evaluated the impact of learning meditation for health and well-being purposes, i.e., learning mindfulness-based stress reduction, and have not evaluated the impact of meditation information provided in a typical college lecture/lab course modality. Oman et al. (2008) compared the impact of a mindfulness-based stress reduction program (MBSR) or Easawaran's Eight-Point Program (EPP) with a waitlist control group in a randomized trial of 44 undergraduate students. They found no differences between the MBSR and EPP groups, and these groups together demonstrated significant benefit with regard to self-reported stress and forgiveness as assessed on self-report measures (Oman et al. 2008).

In a study of 57 undergraduate students, Sears and Kraus (2009) compared brief mindful attention meditation or loving-kindness meditation delivered in statistics classes with longer meditations in a dedicated meditation course and a non-meditating control group. They found improvements in self-reported anxiety and negative emotion comparing the longer meditating with the control group. These changes in outcomes were mediated by changes in cognitive distortions as assessed by the Irrational Beliefs Scale, which assesses cognitive beliefs held by participants (Sears and Kraus 2009; Malouff and Schutte 1986). Specifically, participants in the meditation group demonstrated significant reductions in irrational cognitive beliefs compared with the control group. Deckro et al. (2002) explored the impact of a 6-week mindfulness mediation intervention on college students' psychological distress, anxiety, and perception of stress and found significant self-reported improvements post-intervention compared with a waitlist control group.

Rosenzweig et al. (2003) examined the impact of a 10-week MBSR seminar delivered to 140 medical students compared with 162 students enrolled in a didactic seminar in complementary medicine. These researchers reported significant improvements in the MBSR group versus control group on the profile of mood states post-intervention and concluded that MBSR may be an effective stress management intervention for medical students.

Key research studies regarding integrating contemplative practice into schools (Zenner et al. 2014) have demonstrated that meditation training enhances the ability to focus attention (Jha et al. 2007), reduces stress, increases well-being and strengthens immune function (Davidson et al. 2003; Chiesa and Serretti 2009), and promotes personal development such as self-compassion, empathy, and perspective taking (Shapiro et al. 2007) as assessed on respective self-report measures. A growing body of research supports the idea that meditation cannot only complement but also enhance current educational goals, including educating "the whole person," by aiding and enhancing the development of interpersonal and intrapersonal intelligence.

It is apparent that improvements in memory, concentration, and attention can facilitate knowledge acquisition. Additionally, increased emotional regulation, compassion, and distress tolerance, improved mood, and reduced anxiety would be beneficial to the well-being of students, including college students. Thus, there appears to be great promise for integrating mindfulness meditation into higher education. Although the body of meditation research is growing, comparatively little research has been devoted to applications in educational contexts, especially in higher education. Additionally, to our knowledge, the impact of teaching meditation via a large college survey course administered in the traditional lecture/lab style has not yet been investigated. This method of transmission of information regarding meditation would be an ideal modality in university and college settings. However, it is unclear if this form of education would have an impact on self-reported mindfulness levels and measures of psychological well-being.

The intent of the current research is to explore the impact on mindfulness and psychological well-being of teaching

about mediation via a combined lecture/lab college course modality with a specific focus on teaching a survey course on Buddhist meditation both from a historical perspective and a modern application and practices perspective. Based upon research that has been conducted with college students exposed to learning meditation, we hypothesize that exposure to knowledge and practice of Buddhist meditation traditions and applied contemplative practices derived from them will positively impact self-reported mindfulness in participants as well as positively impact measures of psychological well-being.

Method

Participants

Participants were 205 undergraduate college students recruited from one single undergraduate course titled Buddhist Meditation and Modernity. All students enrolled in the course were eligible to participate in the study. However, completing the surveys was optional for the students—if they chose not to do the surveys, there were other specific projects or papers they could do instead. Participants were 31.9% male and 68.1% female. Participants ranged in age from 18 to 36 years (M = 20.7, SD = 1.6). Participants had completed an average of 2.2 years of college education (SD = 1.4).

Procedure

The University of Virginia IRB approved this study. Completion of the surveys by the students was voluntary, with participation unknown by the faculty teaching the class. A member of the research team addressed the rationale and procedures for participating in the research study in the didactic portion of the class. The didactic portion of the course was held in a large lecture hall twice weekly. The entire class of students was divided into groups of 20 students for the lab portion of the course, during which 16 distinct meditation practices were taught, spread over 13 weeks of lab meetings. These practices are shown in Table 1. The labs were led by one of three contemplative assistants (CAs) trained in these techniques. These CAs were each trained and supervised by two of the authors (DG and KS) and ongoing supervision was provided throughout to maintain adherence and reduce deviations in teaching. Deviations from teaching protocol were assessed and corrections discussed in such supervision. The participant groups were evaluated pre- and post-course, as well as at a point mid-semester, using an online survey administered using QuestionPro software. The students were asked to complete a demographic questionnaire and the seven instruments described above. Each instrument was sent to the students as a separate e-mail survey to complete, and the participants could choose to complete none, some, or all of them. As a result, the number of completions varies from 133 to 197.

Measures

Compassion Toward Self Compassion toward self was measured with the 26-item Self-Compassion Scale (Neff 2003). The scale has been shown to be "a psychometrically sound and theoretically valid measure of self-compassion" (Neff 2003). One item from the scale states, "I try to be understanding and patient toward those aspects of my personality I do not like." Participants rate their behavioral alignment with the statement using a scale of 1 ("Almost never") to 5 ("Almost always"). The questions are divided into six subscales: Self-Kindness, Self-Judgment, Common Humanity, Isolation, Mindfulness, and Over-Identification. For the current sample, the Cronbach's alpha coefficients ranged from .92 to .93 across time points.

Compassion Toward Others Compassion toward others was measured with the 24-item Compassion to Others Scale (Pommier 2011). This scale was modeled after the Self-Compassion Scale and has demonstrated reliability and validity. An example of a statement from the Compassion Scale is, "If I see someone going through a difficult time, I try to be caring toward that person." Participants rate their behavioral or emotional alignment with the statement using a scale of 1 ("Almost Never") to 5 ("Almost Always"). The Compassion to Others Scale is divided into six subscales: Kindness, Indifference, Common Humanity, Separation, Mindfulness, and Disengagement. For the current sample, the Cronbach's alpha coefficients ranged from .88 to .92.

Anxiety Anxiety was measured with the State Trait Anxiety Inventory (STAI) (Spielberger et al. 1983), which has good reliability and moderate validity (Julian 2011). The STAI is divided into two subscales, the State Anxiety Scale and the Trait Anxiety Scale, each of which contains 20 items. Examples of statements on the inventory, which respondents rate on scales of 1–4, include: "I feel at ease" (State subscale; meant to refer to the present moment) and "I am a steady person" (Trait subscale; meant to refer to a general feeling). For the current sample, the Cronbach's alpha coefficients ranged from .93 to .94 across time points.

Positive and Negative Emotion Positive and negative emotion was measured with the Positive and Negative Affect Schedule (PANAS) (Watson et al. 1988). The PANAS provides a list of 20 feelings and emotions; participants assign a rating between 1 and 5 (1 = "very slightly or not at all," 2 = "a little," 3 = "moderately," 4 = "quite a bit," and 5 = "extremely") next to each item on the list. The authors of the PANAS

Table 1 Summary of lab sessions and home practice

	Title of lab session	In-session activities	Practice classification(s)
1	The foundations of contemplative practice: attitudes, posture, and breath awareness	▪ Introductions ▪ Goals for the course ▪ Introduction to sitting meditation ▪ Motivation moment ▪ Basic breathing awareness practice ▪ Transitional moment	Mindfulness
2	Deepening breath awareness	▪ Motivation moment ▪ Synchronizing breath awareness to body awareness ▪ Transitional moment	Mindfulness
3	Mindfulness—breath and body scan	▪ Motivation moment ▪ Breath-body awareness practice ▪ Body scan ▪ Transitional moment	Mindfulness
4	Concentration and quieting practices	▪ Motivation moment ▪ Breath-body awareness practice ▪ Body scan ▪ Walking meditation ▪ Concentration practice ▪ Transitional moment	Mindfulness and concentration
5	Inquiry and analysis practices	▪ Motivation moment ▪ Sitting with the breath ▪ Inquiring into thoughts and feelings ▪ Transitional moment	Mindfulness
6	Inquiry and concentration integration practices	▪ Motivation moment ▪ Sitting with sounds ▪ Walking meditation ▪ Inquiring into thoughts and feelings ▪ Transitional moment	Mindfulness
7	Inquiry, deconstruction, and open practices	▪ Motivation moment ▪ Sitting with the breath/sounds ▪ Walking meditation ▪ Inquiry/deconstruction meditation ▪ Transitional moment	Mindfulness
8	Cultivating compassion—emotions, care, and self-other relationships	▪ Motivation moment ▪ Awareness of breathing ▪ Walking meditation ▪ Compassion meditation ▪ Transitional moment	Mindfulness
9	Creative visualization I: identification, imagination, re-envisioning, and performance	▪ Motivation moment ▪ Visualization of taking away suffering and giving happiness ▪ Visualizing a paradigmatic figure ▪ Transitional moment	Mindfulness
10	Creative visualization II: the human gaze and identity shifts	▪ Motivation moment ▪ Identification with a paradigmatic figure ▪ Letter visualization ▪ Transitional moment	Mindfulness and concentration
11	Mindful movements	▪ Motivation moment ▪ Mindful moving postures, synchronized with the breath ▪ Breath exercises ▪ Visualizing the body and mental space as 5 elements ▪ Transitional moment	Mindfulness
12	Bodily interior explorations	▪ Motivation moment ▪ Mindful moving postures ▪ Breath exercises ▪ Visualizing the body and mental space as 5 elements ▪ Transitional moment	Mindfulness
13	Deep relaxation and open monitoring	▪ Motivation moment ▪ Sitting with sound ▪ Sitting with thoughts and feelings ▪ Sitting with choiceless awareness ▪ Transitional moment	Mindfulness
14	Spontaneity and improvisation	▪ Motivation moment ▪ Sitting with the breath ▪ Active imagination ▪ Transitional moment	Mindfulness

present the instrument as "a reliable, valid, and efficient means for measuring these two important dimensions of mood (Positive and Negative Affect)" (Watson et al. 1988). For the current sample, the Cronbach's alpha coefficients ranged from .88 to .90 across time points for positive emotion and from .87 to .90 across time points for negative emotion.

Positive and Negative Coping Positive and negative coping was measured with the shortened form of the Cognitive and Emotional Regulation Questionnaire (CERQ-short) (Garnefski and Kraaij 2006), an 18-item questionnaire regarding coping with stressful events. The CERQ has been shown to be valid and reliable (Garnefski and Kraaij 2007). Subscales on the questionnaire are self-blame, acceptance, focus on thought/rumination, positive refocusing, refocus on planning, positive reappraisal, putting into perspective, catastrophizing, and other-blame. To provide an example, one item from the self-blame category states, "I feel that I am the one who is responsible for what has happened." A 5-point Likert scale is used for recording answers, with 1 representing "(almost) never" and 5 representing "(almost) always." For the current sample, the Cronbach's alpha coefficients ranged from .78 to .80 across time points for positive coping and from .72 to .74 across time points for negative coping.

Mindfulness Mindfulness was measured using the Mindfulness Attention Awareness Scale (MAAS) (Brown and Ryan 2003) that measures trait mindfulness. It is scored as a 15-item unidimensional scale. A typical question is "I could be experiencing some emotion and not be conscious of it until some time later." For the current sample, the Cronbach's alpha coefficients ranged from .82 to .85 across time points.

Buddhism Meditation and Modernity Course The stated learning objectives for the Buddhism Meditation and Modernity course were to explore Tibetan Buddhist meditation in a cultural context, investigate scientific research on meditation's dynamics, survey contemporary applications (health care, K-12 education, entrepreneurship, and creativity), and experience a variety of modern contemplative meditation practices firsthand. The course included four distinct components revolving around Buddhist meditation in Tibet with the goals of blending tradition and modernity, humanities and sciences, theory, and practice. These components are listed below.

1. Traditional practices: presentation of the original practices and their relationships to philosophy, community, and ways of life.
2. Modern research: presentation of the scientific exploration of these practices and the neurological, biological, and psychological mechanisms of their effects.
3. Contemporary adaptations: recognize how people in an astonishingly varied array of fields are creating new secular adaptations of such practices.
4. Contemplation practice: practice contemplative exercises first hand.

The course consisted of two lecture meetings a week, which involved lecture, presentations, and group interactions. One lecture focused on traditional practices and one lecture focused on contemporary adaptations and modern research. In addition, each student attended a 50-min Contemplative Lab in groups of 20 led by a graduate student CA specializing in Buddhist Studies. The professors and the CAs all made it clear that the contemplative practices actually being taught to the students were entirely secular in nature, without religious content. However, because students were simultaneously studying traditional Buddhist practices through the classical academic means of lectures, readings, and written assignments, the question of the relationship between Buddhist practices and contemporary secularized practices was raised repeatedly as a challenge to be explored by each student.

Students were asked to write creative essays in which they themselves were asked to design a secularized version of a Buddhist practice they were learning about. Thus, they were asked to reflect intellectually on the very process of the secularization of practices drawn from a religious tradition, even as they were exploring the contemplative exercises taught experientially during the labs. For example, during the same weeks in which students were reading classical Buddhist literature (in English translation) on the practice of ānāpānasati (mindfulness of breathing), they were being taught a meditation in which to focus on the sensations of breath at the nostrils, as well as throughout their whole body. While reading and hearing lectures about the four practices of satipaṭṭhāna (mindfulness of body, feelings, thoughts, and religious teachings), they were taught meditation practices in which they were asked to become aware of physical sensations, emotions, and spontaneous thought processes. They were also asked to explore, in a personal way, and with no need whatsoever to accept or reject the Buddhist ideas they were studying, the notions of impermanence, setting a motivation in advance of one's activities, and directing the intention of a practice toward some future goal or aspiration. Students were asked to reflect on the differences between "bare attention" in which the mind is permitted to attend to whatever arises, and more specifically directed practices of single-pointed concentration on a chosen object, known in Buddhist texts as samatha/śhamatha. While learning about the complex interactions and historically contested relationships between practices of concentration and insight (samatha-vipassana, or śhamatha-vipaśhyanā), they were asked to explore, without preconceptions, what it might mean to inquire analytically into the nature of one's personal experience, while still resting in a state of relaxed

concentration. Students were also taught practices for cultivating loving-kindness and compassion toward oneself, toward friends and family, and toward those for whom one usually has feelings of animosity. Students were asked to be aware of the emotions and philosophical questions that would come up in the course of these meditations and to reflect upon these through journal entries and formal essay assignments.

Additional details regarding the content of the laboratory practices and how they fit with our hypothesized area of impact are listed in Table 1. Contemplative lab instructors all had extensive meditation and teaching experience.

Based on previous research findings supporting a positive impact of meditation on well-being, our first hypothesis was that participants would report increased compassion toward the self, compassion toward others, positive emotion, positive coping, and mindfulness over time, as well as decreased anxiety, negative emotion, and negative coping over time. The second hypothesis was that these changes would be mediated by changes in the level of mindfulness of the students.

Addressing the risk that some students might experience emotional discomfort when meditating, we collaborated with Student Health Services to provide services of support and counseling if needed. Specific clinical personnel from Student Health Services, who were familiar with the contemplative practices being taught, were introduced to the class and made available for consultation as needed.

Data Analyses

The primary aims of this research study were to (a) evaluate the extent to which participants reported improvement over time on well-being variables hypothesized to be affected by the meditation course and (b) evaluate whether improvement in mindfulness mediated the improvement in the other variables. The data are grouped as repeated measures nested within individuals. Multilevel modeling is a statistical method that is appropriate for such data, as it allows for the examination of individual growth trajectories by analyzing the information contained in the repeated measures (Raudenbush and Bryk 2002). A two-level multilevel model was used for the present analyses that consisted of repeated measures (level 1) nested within individuals (level 2). The basic multilevel model took the following form:

$$\text{Level 1 (repeated measures): } Y_{ti} = \pi_{0i} + \pi_{1i}(\text{time})_{ti} + r_{ti}$$

$$\text{Level 2 (individuals): } \begin{aligned} \pi_{0i} &= \beta_{00} + u_{0i} \\ \pi_{1i} &= \beta_{10} + u_{1i} \end{aligned}$$

where t indexes time and i indexes individuals. For these analyses, we included a random intercept and random slope for time at the individual level, which allow individual-specific intercepts and slopes. If a significant effect of time was found, we followed up this analysis by including mindfulness as a level-1 time-varying covariate to explore mediation hypotheses. Multilevel models assume normality and homoscedasticity of all error terms and conditional independence of the outcome, given the random effects. We conducted multiple comparisons including eight different variables. As a result, we considered changes over time which had a p value <.006 to be statistically significant based on the Bonferroni correction.

Results

Means, standard deviations, and the number of participants providing data at each time point are summarized in Table 2. The first set of hypotheses addressed overall changes over the course of the class in self-compassion, other-compassion, anxiety, positive emotion, negative emotion, positive coping, negative coping, and mindfulness. Specifically, we hypothesized that participants would show increases in self-compassion, other-compassion, positive emotion, positive coping, and mindfulness over time and would show decreases in anxiety, negative emotion, and negative coping over time.

Several of these hypotheses were supported. Participants reported increased self-compassion over time (est. = .17, SE = .02, p < .001). Overall, participants increased about .34 points over the course of the study. Given the standard deviation of this measure, this represents a Cohen's d of approximately .51 (a medium effect size). Participants also reported increased positive coping over time (est. = .09, SE = .03, p = .001). Overall, participants increased about .16 points over the course of the study. Given the standard deviation of this measure, this represents a Cohen's d of approximately .25 (a small effect size). Participants reported decreased anxiety over time (est. = −.07, SE = .02, p = .006). Overall, participants decreased about .12 points over the course of the study. Given the standard deviation of this measure, this represents a Cohen's d of approximately .21 (a small effect size). Finally, participants reported increased mindfulness over time (est. = .09, SE = .03, p = .001). Overall, participants increased about .15 points over the course of the study. Given the standard deviation of this measure, this represents a Cohen's d of approximately .23 (a small effect size). Other hypotheses were not supported. Participants did not report a significant change in other-compassion, positive or negative emotion, or negative coping over time.

For the dependent variables that showed significant changes over time (i.e., self-compassion, anxiety, and positive coping), we tested whether changes over time were mediated by level of mindfulness. For these analyses, we ran models including mindfulness as a level-1 covariate. In these analyses, if mindfulness was a significant predictor of the dependent variable, and the effect of time on the dependent variable was significantly reduced, this would provide evidence that increases in the dependent variable over time were due to level of mindfulness.

For self-compassion, when mindfulness was included in the model, mindfulness was a significant predictor of self-

Table 2 Descriptive statistics for main outcome variables

Variable	Time point	Number	Mean	SD	*p* value for change over time
Self-compassion	Pre	169	2.91	.69	<.001
	Mid	169	3.10	.65	
	Post	162	3.25	.64	
Other-compassion	Pre	133	3.85	.40	.628
	Mid	163	3.84	.42	
	Post	173	3.87	.47	
Anxiety	Pre	173	2.14	.58	.006
	Mid	177	2.03	.55	
	Post	168	2.02	.57	
Positive emotion	Pre	190	3.10	.77	.250
	Mid	185	3.00	.78	
	Post	169	3.02	.77	
Negative emotion	Pre	192	2.06	.73	.050
	Mid	187	2.01	.70	
	Post	171	1.94	.74	
Positive coping	Pre	134	3.07	.62	.001
	Mid	168	3.12	.60	
	Post	164	3.23	.64	
Negative coping	Pre	133	2.68	.61	.091
	Mid	169	2.61	.57	
	Post	169	2.61	.60	
Mindfulness	Pre	167	3.12	.42	<.001
	Mid	174	3.17	.43	
	Post	156	3.28	.41	

compassion (est. = .40, SE = .04, $p < .001$). Also, the effect of time on self-compassion remained significant but was reduced in magnitude (est. = .14, SE = .02, $p < .001$). The mediated effect time on self-compassion through mindfulness was significant (Sobel $z = 3.13$, $p = .002$).

For anxiety, when mindfulness was included in the model, mindfulness was a significant predictor of anxiety (est. = −.35, SE = .04, $p < .001$). Also, the effect of time on anxiety was no longer significant (est. = −.04, SE = .02, $p = .083$). The mediated effect time on anxiety through mindfulness was significant (Sobel $z = 3.09$, $p = .002$).

For positive coping, when mindfulness was included in the model, mindfulness was not a significant predictor of positive coping (est. = −.02, SE = .05, $p = .756$). The effect of time on positive coping remained mostly unchanged (est. = .08, SE = .03, $p = .007$). The mediated effect of time on positive coping through mindfulness was not significant (Sobel $z = .31$, $p = .756$).

Discussion

The primary aims of this pilot study were to evaluate the feasibility of incorporating Tibetan Buddhist meditation instruction into a traditional large lecture-discussion format class and to explore the impact of the class on mindfulness as well as other psychological components of well-being. We found that (1) mindfulness as measured by the MAAS increased over time among the students enrolled in this course; (2) there were statistically significant increases over time in self-compassion and positive coping, and decreases in anxiety; and that (3) increased mindfulness mediated changes in self-compassion and anxiety.

Shapiro et al. (2008) proposed "meditative practices foster the development of intrapersonal and interpersonal (i.e., emotional) intelligence through the cultivation of greater awareness of one's internal (i.e., cognitive, affective, and somatic) states, with the resulting ability to regulate emotions more effectively." It is with such an understanding that the characteristics under review in this study (compassion toward self and compassion toward others, anxiety, positive and negative emotion, positive and negative coping, and mindfulness) were selected for examination. Furthermore, several of the results of the present study support the findings of others who have investigated the impact of teaching mindfulness and meditation to college students (Burns et al. 2011; Nidich et al. 2009; Oman et al. 2007, 2008; Roberts-Wolfe et al. 2012; Sears and Kraus 2009).

One of the significant aspects of this study is the generation of positive outcomes presumably as a result of participation in a college course with didactic instruction and a practical, hands-on meditation "laboratory" component. Shapiro et al. (2008) noted that little research has been devoted to applications (of meditation) in educational contexts specifically and even less so in higher education. This study is a response to their call for additional exploration regarding how and to what extent meditation may complement the higher education enterprise.

The Mind and Life Education Research Network (2012) proposed a model for contemplative practices such as those taught in this class that includes impacts on individuals at a number of levels, including neural substrates, psychological functions, and behavioral outcomes. This study focused on psychological functions and provides support for enhanced emotion regulation as evidenced by reduced anxiety among the participants that was mediated by an increase in mindfulness. In addition, self-compassion also increased in association with increased mindfulness. According to Germer and Neff (2013), self-compassion appears to facilitate resilience by moderating people's reactions to negative events. The improvement in positive coping among the students is consistent with approaching stressful events using more adaptive approaches. Positive coping was not mediated by mindfulness and may represent a separate set of skills learned in the class.

There are potential adverse consequences for individuals practicing mindfulness and meditation in that these practices may increase anxiety and reactivate responses to trauma. As a result, we collaborated with the university's student health center to make available resources and counseling for any student who might need them. This was made explicit in the class, but to our knowledge no adverse events occurred. However, due to the confidential nature of these services it is possible that students did access them and not report them to us.

Limitations

There are a number of limitations to this study. First, it was observational and there was no control group. Thus, the changes we found may have occurred during the class even without the contemplative laboratory component. Second, we did not follow the students after the conclusion of the class to determine if the improvements they demonstrated persisted. All 205 participants were in the same large class, but they were divided into smaller separate lab sections. We did not collect data on which specific lab section participants attended, so we were unable to include this in our statistical model. Finally, the students were introduced to a wide range of contemplative practices in the labs, and it is not possible to determine which specific practices might have had the greatest impact.

This study suggests that there is value in integrating contemplative practices into the curriculum of academic institutions that enhance "whole person" education in addition to more traditional academic goals, and that this is possible via a relatively large class that consists of both didactic and practice components. This approach has the potential to provide new skills that may be needed by students to optimally face the ever-increasing stresses of life in the twenty-first century.

Compliance with Ethical Standards This study was approved by the UVA Institutional Review Board-Social and Behavioral Sciences and has been performed in accordance with the ethical standards of the 1964 Declaration of Helsinki and its later amendments. All persons involved participated voluntarily and provided their consent prior to their inclusion in the study.

Conflict of Interest All authors declare that they have no conflict of interest.

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