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Effect of Seminar on Compassion on student self-compassion, mindfulness and well-being: A randomized controlled trial

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ABSTRACT
Objective: Mindfulness-based interventions have been shown to have psychological benefits in college students. We explored the effects of an academic Seminar on Compassion on student psychological health. Participants: Forty-one participants (14 male, 27 female, mean age 19.8 ± 1.4 years) were assessed pre- and post- spring semesters 2013 and 2014. Methods: Students were randomized to the Seminar on Compassion or a wait-list control group. Participants completed self-report measures on anxiety, depression, perceived stress, self-compassion, compassion and mindfulness. Salivary alpha-amylase was also assessed. Results: At baseline, self-compassion and mindfulness were negatively correlated with depression, anxiety, and perceived stress. There were significant changes between the intervention and control group from Time 1 to Time 2 in mindfulness, self-compassion, compassion, and salivary alpha-amylase; however, there were no significant changes in depression, anxiety, and perceived stress. Conclusions: The course was effective in increasing mindfulness, self-compassion and compassion, and decreasing a salivary marker of stress.

Introduction
Rates of student depression, anxiety, and panic attacks have increased in recent years, with important implications on student academic achievement and retention. A recent review showed that depression prevalence in college samples range from 10% to 85%, with a weighted mean average of 30.6%. Stress is becoming more prevalent among college students, with a recent study showing 38% of students endorsing feeling stressed, 40% feeling anxious, and 33% feeling depressed. In the most recent report of the American College Health Association’s National College Health Assessment, 34.4% of students reported stress, 26.5% reported anxiety, and 16.4% reported depression as interfering with their academic performance.

Bamber and Schneider reviewed studies on mindfulness meditation on stress and anxiety and reported reductions in anxiety in 82% of the studies and reductions in stress in 74% of the studies that were reviewed. The authors were cautious in saying that these findings were inconclusive, partly because of the heterogeneity of the interventions that fell under the term “mindfulness meditation.” Other studies have shown similar results that mind/body and mindfulness-based interventions lower stress, improve mood, decrease anxiety, and reduce psychological distress and perceived stress.

Mindfulness is “the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment.” Introducing mindfulness in college classrooms is not a novel idea and data support that mindfulness relates to positive outcomes such as decreased stress, increases in mindful awareness traits and reductions in rumination and state anxiety, increases in mindfulness, subjective well-being, empathy, and hope, and larger declines in perceived stress and rumination.

Mindfulness has also been implicated in better cognition.

Compassion is defined as “being touched by the suffering of others, opening one’s awareness to others’ pain and not avoiding or disconnecting from it, so that feelings of kindness towards others and the desire to alleviate their suffering emerge; self-compassion is defined as compassion directed to the self. Both compassion and self-compassion are conceptualized as having three components: self-kindness, common humanity, and mindfulness. Self-compassion has been shown to predict student well-being. Studies have shown how self-compassion moderated reactions to negative self-evaluation. Smeets and colleagues conducted a brief self-compassion intervention that increased student well-being and resilience. It has been proposed that self-compassion deactivates the...
self-threat and activates self-soothing.28 Similarly, compassion meditation has been shown to decrease self-report and physiological markers of stress.29,30

Research in K-12 educational system has shown how mindfulness and meditation have been integrated into the curriculum successfully, and how these classes have helped with student success outcomes such as better academic performance, decreased truant behaviors, and increased emotional well-being.31–35 Classes in meditation are not necessarily new in college campuses. These classes have been offered in Religious Studies departments36,37; however, research on their effects on student well-being is in its infancy. Previous studies have shown promise in changing outcomes among students who take academic elective or required courses focused on mindfulness and compassion.21,38,39 Many mindfulness based interventions offered to college students are elective, thus creating a barrier of additional commitment of time and effort to participate. A course that satisfies a requirement for graduation may help overcome these barriers.

One critique of research studies is the reliance on self-report for measures of stress. In our sample, we collected a physiological marker of stress. Salivary alpha-amylase (sAA), a digestive enzyme produced and excreted from norepinephrine-responsive salivary gland cells, has been proposed as a marker of psychophysiological stress.40,41 sAA has been shown to rise during acute laboratory stressors, such as the Trier Social Stress Test,42 a math task,43 watching a stressful video,44 and physical stressors such as exercise and temperature extremes.45 It is also elevated in real-world settings such as giving a lecture46 or taking an academic examination.45,47,48

Our previous qualitative observations of the Seminar on Compassion show that students who meditate and study compassion become more resilient to stress, have improved academic achievement, and achieve an increased sense of well-being.16 In this study, we explored the correlations among mindfulness, compassion, self-compassion and these psychological outcomes: depression, anxiety, and perceived stress and hypothesized that higher mindfulness, compassion and self-compassion are negatively correlated with the psychological outcomes. We hypothesized that participation in a seminar on compassion would increase mindfulness, compassion and self-compassion and decrease depression, anxiety and perceived stress among college students.

Methods

Participants and procedures

This study was approved by the institution’s IRB. Flyers were distributed across a small, liberal arts campus in Southern California, inviting students to participate in a research study on meditation and stress. In addition, the Seminar on Compassion was listed as “permission-only” on WebAdvisor to cue students to contact the professor if they were interested in enrolling in the class and to submit their names for the registration lottery. From this pool of students who were interested in either the class or the study, students were randomly assigned to take the class (intervention group) or offered a short workshop at the conclusion of the spring semester (control group).

After class registration was completed, students were given the opportunity to enroll in the study. Participants had to be proficient in English, not have severe mental health issues such as active psychosis, not have substantial previous meditation experience, not be pregnant, and not using anxiolytic medications or tobacco. From the students in the lottery pool whose names were not randomly selected to register for Seminar on Compassion, we recruited a similar matched sample. Figure 1 shows the flow of recruitment procedures.

Because of the limited space in Seminar on Compassion, we decided to run this randomized trial over two years. Students completed baseline questionnaires during finals week prior to the class (December 2012 and 2013). Follow-up measures were completed during finals week of the spring semesters (April 2013 and 2014). Participants who completed an assessment both prior to and following the seminar were compensated $50; those who completed only the first assessment were compensated $20.

Assessment took approximately an hour and a half. Participants completed self-report measures on stress, anxiety, depression, and well-being and then they were assessed for salivary samples for amylase. Participants were asked not to drink any alcohol in the 24 hours prior to the experiment, and not to eat, drink, exercise, or brush their teeth in the hour prior to testing. Participants were also instructed to drink caffeine according to their normal pattern of caffeine intake.

![Figure 1. Flow diagram of participants' enrollment, randomization, and analysis.](image-url)
Participants were tested between 2 – 5PM, having been awake for a minimum of six hours prior to their appointment. The time of a participant’s appointment was matched in time 1 and time 2. Saliva was collected using an oral swab (Salimetrics, State College, PA) after five minutes of listening to an mp3 of calming beach sounds. All saliva samples were stored at −20°C immediately after collection and later analyzed using the sAA kinetic enzyme assay kit (Salimetrics, State College, PA). The AgileReader™ ELISA Plate Reader (ACTgene, Inc., Piscataway, NJ) was used for the kinetic sAA assay. The average coefficient of variation on inter-assay replicates (non log-transformed values) was 9.6%. Coefficient of variation is defined as the standard deviation of replicates divided by the mean of replicates; it is a proportional measure of the precision of an assay. The manufacturer of this assay (Salimetrics) states that coefficient of variation values below 15% are acceptable.49

Seminar on compassion

The course met for 80 minute sessions, twice a week for the 15-week semester, and students earned four units of course credit for the university’s general education requirements and/or religion major requirements. Students received a numerical course grade based on participation, essays, and a portfolio. The semester-long Seminar on Compassion was developed in 2005 and was described in the catalog as follows:

Explores what it means to live a life of compassion through these lenses: 1) biographical models such as Gandhi, Nelson Mandela, The Dalai Lama, Mary Oliver, Viktor Frankl, and Mother Teresa; 2) the compassion teachings of the world’s religions; 3) first-person inner cultivation of compassion through specific meditation methods and contemplative practices; 4) applying these inner methods and contemplative practices to the “outer” world through engagement in substantial service beyond the classroom walls.

Contemplative methods are an integral part of the Compassion course and are incorporated throughout the semester. Students learn many different contemplative methods: mindfulness, sitting meditation, deep listening, nature observation, walking meditation, labyrinth walking, metta (loving-kindness meditation), tonglen meditation (Tibetan Buddhist), Mother Teresa’s method of seeing Christ in every person, Sufi dance and poetry, and others. Students read the life stories of contemplative exemplars who have founded their work on a contemplative process such as Gandhi, the Dalai Lama, Mary Oliver, Mother Teresa, and Nelson Mandela. All assignments in the course (exams, papers, presentations, and community service) require integration of contemplative process alongside analytical thinking.

Measures

Five facet mindfulness scale (FFMQ)50

FFMQ is a measure based on a factor analytic study of five independently developed mindfulness questionnaires. This 39-item Likert-scale questionnaire has five factors and all have good internal consistency for our sample: observing (“I pay attention to sensations, such as the wind in my hair or the sun on my face” Cronbach alpha = .76), describing (“I have trouble thinking of the right words to express how I feel about things” Cronbach alpha = .92), acting with awareness (“I find myself doing things without paying attention” Cronbach alpha = .89), non-judging of inner experience (“I think some of my emotions are bad or inappropriate and I shouldn’t feel them” Cronbach alpha = .89), and non-reactivity to inner experience (“I perceive my feelings and emotions without having to react to them” Cronbach alpha = .79). Cronbach alpha for the total score for our sample was .92 (T1) and .94 (T2).

Self-compassion scale (SCS)23

SCS is a 26-item scale used to measure self-compassion, which is conceptualized as a type of relating to the self that involves self-kindness, a sense of common humanity, and mindfulness.23,51 This measure has good reliability and has been shown to relate to lower levels of depression, anxiety and stress.52-54 Higher total scores signify higher self-compassion. Cronbach alpha for our sample was good at .94 (T1) and .94 (T2).

Compassion scale (CS)55

CS is a 24-item scale measuring caring directed toward others. It is similar to the Neff’s (2003) Self-Compassion Scale, both have roots in Buddhist constructs of compassion that involve being present, sharing common humanity, and kindness. High scores signify higher levels of compassion. Cronbach alpha was .87 (T1) and .88 (T2).

The center for epidemiological studies-depression (CES-D)56

CES-D is a 20-item measure that assesses symptoms associated with depression, such as restless sleep, poor appetite, and feeling lonely. The CES-D has been used in both clinical and nonclinical populations to screen for clinical levels of depression.57,58 High scores indicate greater depressive symptoms. The CES-D has good sensitivity and specificity and high internal consistency.59 Cronbach alpha for CES-D was .88 (T1) and .90 (T2).
The state-trait anxiety inventory (STAI)\textsuperscript{60}
STAI is a 40-item measure of trait and state anxiety. Higher scores indicate greater anxiety. Reliability has been substantiated with average test-retest correlations of 0.70 (state) and 0.88 (trait). \textsuperscript{60,61} Cronbach alpha for STAI-State was .90 (T1) and .95 (T2) and for STAI-Trait was .91 (T1) and .92 (T2).

Perceived stress scale (PSS)\textsuperscript{62}
PSS is a 10-item scale that measures the degree to which one thinks that one’s life is stressful. Higher scores indicate higher perceived stress. It measures perception of unpredictability and uncontrollability as well as current levels of experienced stress. Cronbach alpha for our sample was .85 (T1) and .89 (T2).

Statistical analyses
All statistical analyses were performed using IBM SPSS 23 statistical software (International Business Machines Corporation, Armonk, NY, 2015). After descriptive analyses and calculation of bivariate Pearson correlations, repeated measures ANOVAs were conducted to assess the time (pre- and post-test) by randomization interaction. Data were checked for violations of assumptions and log transformations were applied to those that violated said assumptions. Effect sizes were calculated on the mean differences between groups from baseline to follow-up. To account for multiple comparisons, the Benjamini-Hochberg correction was used to keep the false discovery rate at 0.05.\textsuperscript{63}

Pre- versus post-course sAA levels were compared using a two-way mixed ANOVA. Data were examined for violations of normality and assumptions of ANOVA prior to analysis. This 2 × 2 ANOVA tested randomization (between subjects factor: control and compassion course) and time (within subjects factor: pre vs. post course) with an alpha level of 0.05.

Results
Participants
Forty-one college students enrolled in the trial; 24 and 17 in the first and second years, respectively. Participant ages ranged from 18–22 years, with mean of 19.78 years (SD = 1.36). Most were women (66%). Twenty-one (51%) participants were in the intervention group versus 20 (49%) in the control group; there were no gender differences in distribution in each group. Adherence to the intervention was good. Fifty-two percent (11/21) of the participants in the intervention group did not miss a single class; 5% (1/21) missed one class; 38% (8/21) missed 2 classes. Only one participant (5%) missed 3–6 days of class.

Of the 28 students who reported their overall GPA, the mean was 3.29 (SD = 0.45). Roughly half of both the intervention and control groups reported having had prior experience in meditation, mindfulness or contemplative practices, with 21 participants (51%) reporting prior experience. None of the variables were significantly different between groups at baseline. Thirty-four participants returned for the second assessment. There was no association between gender and whether or not participants returned for the second assessment.

At baseline (n = 41), none of the variable means in the intervention and control group were significantly different from each other. Compassion was not significantly correlated with either mindfulness (r = .28, p > .05) or self-compassion (r = .15, p > .05). Mindfulness was significantly correlated with self-compassion (r = .69, p < .001). Mindfulness and self-compassion were significantly correlated to psychological outcomes, whereas, compassion and sAA were not (Table 1).

Mean scores of the different measures were comparable to normative means in the literature (see Table 2). There were significant increases in mindfulness, self-compassion and compassion among the students in the intervention group versus the control group from baseline to follow-up (see Table 2). However, changes in self-report measures of depression, anxiety, and stress were not statistically significant. sAA significantly decreased among students in the intervention group (n = 18), but increased in the control group (n = 16; Figure 2), as shown by the interaction effect, $F(1, 32) = 4.625, p < .05$

Comment
In this study, we quantitatively demonstrated the impact of the Seminar on Compassion with students in the Seminar endorsing higher mindfulness, compassion and

Table 1. Pearson product-moment correlations between mindfulness, self-compassion, compassion, log\textsubscript{10} alpha-amylase and psychological measures at baseline.

<table>
<thead>
<tr>
<th></th>
<th>Depression</th>
<th>State Anxiety</th>
<th>Trait Anxiety</th>
<th>Perceived Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Compassion</td>
<td>-.59**</td>
<td>-.56**</td>
<td>-.48**</td>
<td>-.70**</td>
</tr>
<tr>
<td>Compassion</td>
<td>-.22</td>
<td>-.20</td>
<td>-.08</td>
<td>-.04</td>
</tr>
<tr>
<td>FFMQ Observe</td>
<td>-.12</td>
<td>-.16</td>
<td>.001</td>
<td>-.27</td>
</tr>
<tr>
<td>FFMQ Describe</td>
<td>-.35**</td>
<td>-.51**</td>
<td>-.15</td>
<td>-.46**</td>
</tr>
<tr>
<td>FFMQ Act</td>
<td>-.54**</td>
<td>-.51**</td>
<td>-.22</td>
<td>-.47**</td>
</tr>
<tr>
<td>FFMQ Nonjudge</td>
<td>-.49**</td>
<td>-.43**</td>
<td>-.36</td>
<td>-.60**</td>
</tr>
<tr>
<td>FFMQ Nonreact</td>
<td>-.58**</td>
<td>-.56**</td>
<td>-.48</td>
<td>-.69**</td>
</tr>
<tr>
<td>FFMQ Total</td>
<td>-.61**</td>
<td>-.64**</td>
<td>-.35**</td>
<td>-.72**</td>
</tr>
<tr>
<td>log\textsubscript{10} alpha-amylase</td>
<td>.04</td>
<td>.05</td>
<td>-.26</td>
<td>-.09</td>
</tr>
</tbody>
</table>

Note:
\*significant at $p < .05$,
\**significant at $p < .001$, (n = 41). FFMQ: Five Facet Mindfulness Questionnaire.
Table 2. Unadjusted pre- and post-test means for all variables, repeated measures results and effect sizes.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Normative Samples</th>
<th>Intervention</th>
<th>Control</th>
<th>F</th>
<th>p</th>
<th>Partial eta Sq</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre (SD)</td>
<td>Post (SD)</td>
<td>Pre (SD)</td>
<td>Post (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-Compassiona</td>
<td>3.11 (.67)</td>
<td>2.86 (.79)</td>
<td>3.59 (.88)</td>
<td>2.83 (.68)</td>
<td>3.06 (.53)</td>
<td>8.95 .005 .218</td>
</tr>
<tr>
<td>Compassionb</td>
<td>3.84 (0.60)</td>
<td>4.39 (0.38)</td>
<td>4.48 (0.36)</td>
<td>4.08 (0.56)</td>
<td>3.95 (0.46)</td>
<td>5.15 .03 .139</td>
</tr>
<tr>
<td>FFMQ Observe c</td>
<td>24.32 (4.84)</td>
<td>29.06 (6.06)</td>
<td>30.67 (6.60)</td>
<td>28.88 (3.96)</td>
<td>27.63 (4.87)</td>
<td>2.73 .11 .079</td>
</tr>
<tr>
<td>FFMQ Describe d</td>
<td>26.46 (6.01)</td>
<td>28.83 (7.25)</td>
<td>31.67 (6.99)</td>
<td>27.56 (7.40)</td>
<td>26.63 (5.84)</td>
<td>5.45 .03 .145</td>
</tr>
<tr>
<td>FFMQ Act e</td>
<td>25.31 (5.77)</td>
<td>24.67 (7.34)</td>
<td>27.67 (7.47)</td>
<td>25.00 (5.57)</td>
<td>24.44 (5.78)</td>
<td>2.46 .13 .072</td>
</tr>
<tr>
<td>FFMQ Nonjudge f</td>
<td>27.75 (5.90)</td>
<td>26.61 (8.79)</td>
<td>31.44 (7.55)</td>
<td>27.25 (7.16)</td>
<td>27.50 (6.20)</td>
<td>4.86 .03 .132</td>
</tr>
<tr>
<td>FFMQ Nonreact g</td>
<td>20.50 (3.82)</td>
<td>21.61 (5.86)</td>
<td>24.44 (6.02)</td>
<td>21.16 (3.63)</td>
<td>20.00 (3.18)</td>
<td>3.93 .06 .109</td>
</tr>
<tr>
<td>FFMQ Total h</td>
<td>N/A</td>
<td>26.15 (4.84)</td>
<td>29.18 (5.39)</td>
<td>25.97 (3.87)</td>
<td>25.24 (2.81)</td>
<td>4.44 .007 .209</td>
</tr>
<tr>
<td>Depression i</td>
<td>13.86 (7.37)</td>
<td>17.78 (12.36)</td>
<td>13.78 (11.44)</td>
<td>18.38 (6.88)</td>
<td>17.00 (8.89)</td>
<td>5.34 .47 .016</td>
</tr>
<tr>
<td>State Anxiety j</td>
<td>35.72 (10.89)</td>
<td>37.61 (12.39)</td>
<td>34.00 (11.52)</td>
<td>38.19 (8.01)</td>
<td>42.00 (11.57)</td>
<td>3.16 .09 .090</td>
</tr>
<tr>
<td>Trait Anxiety k</td>
<td>41.89 (10.40)</td>
<td>40.36 (11.38)</td>
<td>35.61 (11.85)</td>
<td>46.16 (16.85)</td>
<td>44.72 (16.20)</td>
<td>0.61 .31 .032</td>
</tr>
<tr>
<td>Perceived Stress l</td>
<td>14.2 (6.2)</td>
<td>16.81 (7.80)</td>
<td>12.67 (8.29)</td>
<td>17.91 (6.97)</td>
<td>17.50 (6.29)</td>
<td>2.76 .11 .079</td>
</tr>
<tr>
<td>Log10 Alpha-amylase (U/ml)</td>
<td>N/A</td>
<td>1.49 (.48)</td>
<td>1.43 (.44)</td>
<td>1.72 (.36)</td>
<td>1.85 (.45)</td>
<td>4.64 .04 .126</td>
</tr>
</tbody>
</table>

Note: Statistical significance was calculated using repeated measures ANOVA with treatment group as predictor. N = 34, Intervention = 18; Control = 16. *significant at p < 0.05, **significant with Benjamini-Hochberg correction at p < .05. Correction was done for FFMQ (Five Facet Mindfulness Questionnaire) family-wise analyses only.


Self-compassion compared to the control group. Interestingly, students in the intervention group did not significantly differ from the control group in their rates of depression, anxiety or perceived stress, even though the means were clearly trending in the right direction with the intervention group showing less depression, anxiety, and perceived stress compared to the control group. There was a significant interaction between time and randomization for sAA, in that those in the control group had significantly higher levels of this salivary marker of stress in follow-up compared to those in the intervention group.

Since the class was not specifically designed to address stress, depression, or anxiety, this may contribute to lack of significant results in these variables. Other studies have shown reduction in stress and anxiety because the intent of these interventions was to address such issues. The class was multi-faceted. There was a contemplative component (experiential exercises of different meditations), academic (studying works of leaders in contemplative movement) and community service (e.g., sitting with a dying person in Metta). One can argue that the different facets of the class are “other-focused” and not “self-focused” (e.g., how can I reduce my own stress and suffering?), which may explain the lack of stronger effect on participants’ well-being.

Our data complements other recent work examining the relationship between compassion/self-compassion and sAA reactivity to an acute stressor, the Trier Social Stress Test. In one study, writing a letter giving support to a friend caused a trend of reduced sAA response. In 105 female participants, listening to a recording intended to foster self-compassion lowered sAA reactivity.
compared to control groups, although the sAA reactivity was not correlated to levels of self-compassion prior to the intervention. Trait self-compassion was negatively correlated to amylase reactivity in a sample of 33 young adults, although not to baseline sAA levels. Our establishment of an effect on sAA due to a compassion intervention outside of the Trier Social Stress Test paradigm is a novel addition to this field to our knowledge.

**Practical applications**

Conley, Travers, and Bryant conducted research on the benefits of a psychosocial wellness seminar for first-year college students and showed that engagement in skills practice predicted increases in adjustment and stress management. Their results mirrored those of a larger review that demonstrated supervised skills practice interventions as most effective in changing emotional distress, social and emotional skills, self-perception, interpersonal relationships, and health among college students. Of the different skills-based interventions, those that focused on mindfulness were shown to be more effective than other formats. Results of these previous studies, as well as ours, support the importance of developing appropriate curriculum that can serve not only an academic purpose but a wellness one as well.

In addition to the experiential piece, the power of the curricular approach is the learning community itself. Meeting twice a week for a semester brings a sense of peer support for healthy and pro-social outlooks. Students are in a powerfully aligned learning community that honors the values of self-honesty, self-regulation, trust, loving kindness, compassion and being responsible for one’s own attitudes, actions and feelings. Having a strong support system can help students stay accountable to acquiring these new skills, as well as engaging deeply in their learning.

Demonstrating the efficacy of an academic course in reducing stress and increasing psychosocial well-being can have implications in college curricular planning and policy. Faculty can be encouraged to seek professional development related to mindfulness and meditation. Teachers who practice meditation and mindfulness can benefit psychosocially from engaging in this practice. In addition, this can encourage them to make pedagogical changes incorporating mindfulness and meditation into their courses, which will then benefit students. Faculty could be encouraged to offer first year seminars with emphasis in mindfulness for the students who are most at risk of experiencing great stress. One of the authors of this study offered a course on the challenge of obesity and incorporated a mindful eating experiential approach as part of the course. Colleges have departments devoted to increasing student wellness; these departments can potentially collaborate with their faculty in offering courses that can satisfy both academic credits and promote wellness issues. We hope that this study can also provide information for future researchers as they navigate design issues such as balancing the need to satisfy the scientific method of randomly assigning participants to different groups while honoring students’ needs for registration. One of the strengths of our study was the existing resource of a faculty member who had a known presence on campus of encouraging spiritual growth and wellness; she was already devoted to teaching contemplative practices as well as stewarding in the Meditation Room on campus. Other campuses may not have such resources, which speak to the need to encourage faculty development in this area.

**Limitations**

Our study had several limitations. The data on the small sample were collected over two years, with transitions in student research assistants that could have affected our results. Our recruitment and randomization were constrained with some student needs (e.g., some graduating seniors really wanted to take the class and we couldn’t turn them away). This may have influenced the data in that students were self-selecting into the compassion class because of their inherent interests in contemplative education. We had some students not complete the 2nd assessment; the length of time for the assessment possibly contributed to respondent fatigue and lack of motivation to return for the second assessment.

We offered the assessments during the finals week prior to and immediately after the semester. Anecdotally, students were reporting to us that they were not stressed since finals week tended to be relatively light, i.e., they only had to focus on the couple of tests instead of completing multiple requirements in the weeks prior. This may have affected stress and anxiety scores.

**Conclusions**

The Seminar on Compassion is one of the popular courses on campus, and one that is reportedly transformative. Our data support that this course does increase mindfulness, self-compassion and compassion. The lack of immediate changes to self-reported psychological well-being is not discouraging to us. Our finding of a reduction in a salivary marker of stress is a promising result supporting the use of contemplative curriculum in reduction of stress. Future studies could examine long-term effects of such a course, examine the use of more sensitive assessment tools for nonclinical populations, as well as the effects of such a
course on students who are reporting higher than normal levels or stress, anxiety or depression.

Conflict of interest disclosure

The authors have no conflicts of interest to report.

Acknowledgments

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