The Effect of Podcasting Mindfulness Exercises on Stress and Anxiety

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Abstract

Mindfulness is a non-judgmental awareness associated with stress reduction (Greer, 2009). This research examined whether podcasting mindfulness exercises can facilitate meditation and reduce math anxiety in undergraduates. The experimenter led participants in weekly, guided meditations; students were encouraged to practice mindfulness daily for 15 minutes. Podcasts of mindfulness exercises were provided on iTunesU to half the participants. Counter to prediction, there was no significant difference between participants assigned to the podcast condition or a control condition, and no decrease in math anxiety. Math anxiety was negatively correlated with emotion regulation, mindful presence, acceptance, awareness, and well-being. There were significant improvements in mindful presence, acceptance, and well-being after 4 weeks of mindfulness practice. Mindful presence accounted for 89% of the variability in well-being, and emotions regulation accounted for an additional 6% of variance in well-being over and above mindful presence. The results are discussed in terms of mindfulness and well-being.
The Effect of Mindfulness Practice on Math Anxiety

The transition to college can be stressful and many students experience anxiety that can undermine academic performance. By learning more effective strategies of emotion regulation, students can manage their anxiety and improve their performance. Researchers have examined methods for reducing math anxiety (Ramirez & Beilock, 2011). Past work has shown meditation can reduce stress and enhance attention (Greeson, 2009; Grossman, Niemann, Schmidt, & Walach, 2004; Tang, et al., 2007), but few studies have examined whether mindfulness may help reduce math anxiety (Shiverick, 2012). This research investigated whether podcasting mindfulness exercises would help reduce stress, math anxiety, and improve well-being in a sample of undergraduates. The relations between mindfulness, emotion regulation, and math anxiety are explored.

Math Anxiety

Math anxiety can be triggered by intrusive thoughts about math, preoccupation with math performance, or worries about math evaluation that reduce online working memory and impair mathematical performance (Ashcraft & Moore, 2009). Individuals with high math anxiety (HMA) can experience fear and apprehension in anticipation of math tasks (Lyons & Beilock, 2012). The emotion regulation literature shows that attention regulation and cognitive reappraisal are central processes of emotion regulation (Koole, 2010). Directing attention away from negative information or re-interpreting aspects of stimuli can help inhibit unwanted emotion and decrease activation of emotion areas in the brain. Research has investigated cognitive approaches to reducing math anxiety such as expressive writing (Ramirez & Beilock, 2011) and reframing techniques (Jamieson, et al., cited in Maloney & Beilock, 2012). Interventions that help students
regulate negative emotions and worry can improve math performance, but few studies have investigated whether meditation can reduce math anxiety (Shiverick, 2013).

*Mindfulness Meditation*

Mindfulness is an intentional, non-judgmental awareness of sensations and experiences in the present moment (Kabat-Zinn, 1990). Meditation involves processes of attention regulation and cognitive reappraisal, but includes bodily strategies such as breathing and progressive relaxation (Feldman, et al., 2007). Research shows that guided meditation practice is associated with enhanced attention, awareness, and acceptance, decreased stress, anxiety, and depression (Goldbin & Gross, 2010; Greeson, 2009), and reduced activation in emotion areas of the brain (Desbordes, et al., 2012). Furthermore, mindfulness practice appears to improve emotion regulation (Cahn & Polich, 2006, Holzel, et al., 2012), and Individuals with higher mindfulness also report better self-regulation, higher positive affect, and well-being (Grossman, et al., 2004).

Mindfulness Based Stress Reduction (MBSR) is an established program that involves 8-weeks of training that has been used with clinical samples (Grossman, et al., 2004) and students (Rozenzweig, et al, 2003); however, shorter meditation interventions can also be effective for reducing stress and anxiety. For example, Harnett and colleagues (et al., 2010) found reduced distress and increased short-term life satisfaction in a brief group-based mindfulness program that consisted of three, 2-hour sessions. Tang, et al. (2007) reported beneficial effects of enhanced attention and stress reduction after 5 days of meditation for 20 minutes per day. In addition, Niss and Arch (2013) found a decrease in test anxiety in high school students after a 9-minute mindfulness exercise before math exams. However, the effect of mindfulness practice may be more beneficial for individuals with high math anxiety (Shiverick & Eckhoff, 2012).
Research has investigated the effectiveness of web-based mindfulness training (Bowden, 2011; Gluck & Maercker, 2011; Krause, et al., 2012). Bowden conducted an 8-week online intervention of four self-administered, guided meditations, and found that 10-20 minutes of formal meditation and 20-30 minutes of informal mindfulness per day was optimal. Completion rates were low (1 in 5 participants after 8-weeks), but there were significant decreases in distress and gains in mindfulness and well-being. Krause and colleagues conducted an online mindfulness course with 10 interactive sessions in which participants accessed instructional videos with guided formal meditations (breathing, body scan) and informal mindfulness exercises over 6 weeks. Perceived stress decreased after the intervention and was stable after one month. In a pilot study, Gluck and Maercker randomly assigned 49 participants to a self-guided online training in modules for 12 days (two 20-minutes sessions per day) or wait-list control group. The results showed trends in decreased stress and negative affect. Web-based mindfulness resources may best supplement traditional guided meditations with an instructor.

The present study follows a longitudinal study of mindfulness and math anxiety with technological applications (podcasts, iTunesU, website) to facilitate individual meditation practice. Participants met weekly with the principal investigator (PI) who led them in guided meditations, in-class exercises, and home practice assignments for 6 weeks. Students were instructed to practice mindfulness for 15 minutes a day using an audio CD, or electronic applications including podcasts of mindfulness exercises available from a website on iTunesU, and a mindfulness app. Participants completed a comprehensive questionnaire on math anxiety, mindfulness, and emotion regulation at the first meeting and again after 4 weeks. It was hypothesized that the use of the electronic mindfulness applications would facilitate mindfulness practice leading to greater reductions in stress, math anxiety, and increased well-being.
Method

Participants

Thirteen undergraduates (\(M_{\text{AGE}} = 18.9, SD = 1.08\), range: 18 to 32; 8 Females) from a midwestern university were recruited to participate in the study. Participants were predominantly White (90% White, 5% Latino, 5% East Indian), reflecting the demographics of the local community. Students received no compensation for their participation. Due to low sample sizes, participants from phase 1 and phase 2 of the study were combined into a single sample.

Materials

The materials included Mindfulness for Beginners (Kabat-Zinn, 2012), Full Catastrophe Living: Using the Wisdom of Your Body and Mind to Face Stress, Pain, and Illness (Kabat-Zinn, 1990), Guided Mindfulness Meditation—4 Practice CDs (Kabat-Zinn, 2002). A course page was created on iTunes U which is a dedicated online platform for delivering podcasts and course content electronically. Electronic resources included mindfulness applications (‘Mindfulness App’; www.mindapps.se) for use of personal electronic devices. Four, 5-minute podcasts of mindfulness exercises were recorded by the PI and the podcasts were available for students to download from the iTunesU course page and the instructors website.

A questionnaire included demographic information (age, gender, year in school), math history (number of math courses, highest math course), personal history (counseling or medication for anxiety), Perceived Stress Scale (PSS, Cohen, Kamarck, & Mermelstein, 1983), Abbreviated Mathematics Anxiety Rating Scale (A-MARS; Alexander & Martray, 1989; Suinn & Winston, 2003), Math Anxiety Scale Revised (MAS-R, Bai, Wang, Pei, & Frey, 2009), Brief Symptom Inventory (Derogatis & Melisaratos, 1983), Emotion Regulation Questionnaire (ERQ; Gross & John, 2003), Short Version of the Freiburg Mindfulness Inventory (FMI; Walach, et al.,
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2006), Mindfulness Attention and Awareness Scale (MAAS; Brown & Ryan, 2003), short form of Positive and Negative Affect Scales (PANAS; Watson, Clark, & Tellegen, 1988), and Rapid Assessment of Well-Being–Short Depression and Happiness Scale (SDHS; Joseph, Linley, Harwood, Lewis, & McCollom, 2004).

Procedure

The PI completed the Mindfulness Program at UW-Health Center in Madison in the summer of 2013. The experimenter created a course page on iTunesU using an iPad and podcasts of mindfulness exercises (Introduction, Foundations of Mindfulness, Mindfulness of the Breath, Mindfulness of Breathing) using an iPod. The podcasts were posted on iTunesU and a website for the study (http://www.uwplatt.edu/psychology/mindfulness-research-study, http://www.uwplatt.edu/psychology/introduction-mindfulness). The Mindfulness App was also included on the iTunesU course for students to download to their personal electronic devices (iPhone, smartphone, etc.) to facilitate mindfulness practice. Initially, an online student response system was proposed to assess mindfulness practice in students, but given the low use of electronic resources among participants, this was not practical.

Participants were recruited from introductory Psychology and Math courses by flier and general campus-wide email. Participants were informed the study involved a time commitment of meeting weekly for one hour over the course of 6 weeks. The experimenter met with students once a week and led the group in guided meditations (e.g., eating, breathing, body scan, thoughts and emotions) for six weeks. Participants were provided with a copy of the book, *Mindfulness for Beginners* (Kabat-Zinn, 2012) to use during the study that included an audio CD, and they were encouraged to practice mindfulness daily for 15 minutes. One sample of participants (n=6) was provided with podcasts of mindfulness exercises (available on iTunes U or study website) in
a between-subjects design. Participants completed the questionnaire on the first meeting and again after 4 weeks. The last session involved student reflection on their experiences.

**Results**

An independent samples t-test revealed that the main hypothesis was not supported. There were no significant difference in math anxiety between participants who were provided with the podcasts of mindfulness exercises on iTunesU and participants provided with the book and audio CD only, for either the math anxiety scale revised (MAS-R), \( t(11) = -0.17, p = .87 \), or the abbreviated math anxiety scale (A-MARS), \( t(11) = -1.19, p = .28 \).

In addition, related-sample t-tests were used to examine change in the main dependent variables. However, these results showed that, overall, there was no significant change in either measure of math anxiety: the math anxiety scale revised (MAS-R), \( t(12) = 1.11, p = .29 \), or the abbreviated math anxiety scale (A-MARS), \( t(12) = 0.52, p = .60 \), which did not support the hypothesis that mindfulness training would reduce math anxiety. In addition, there was no significant change in emotion regulation, \( t(12) = -1.64, p = .13 \). However, there were significant improvements in mindfulness presence (FMI), \( t(12) = -2.46, p = .03 \), and mindfulness acceptance (FMI), \( t(12) = -2.35, p = .04 \). Participants reported significantly greater mindfulness presence (MDIFFERENCE = 0.69, SDDIFFERENCE = 1.02) and acceptance (MDIFFERENCE = 0.60, SDDIFFERENCE = 0.92) after four weeks of mindfulness practice than at the start of the study. Finally, there was a marginally significant increase in psychological well-being, \( t(12) = -1.92, p = .08 \).

Examination of Pearson's correlations (Table 1) showed that math anxiety (A-MARS) was negatively correlated with emotion regulation (cognitive reappraisal), \( r(11) = -.73, p = .004 \), mindfulness presence, \( r(11) = -.68, p = .01 \), mindful acceptance, \( r(11) = -.67, p = .04 \), mindful
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awareness, $r(11) = -.66, p = .02$, and well-being, $r(11) = -.70, p = .007$, and positively correlated with negative affect, $r(11) = .73, p = .004$.

Multiple regression analysis revealed that, together, perceived stress, physiological symptoms, mindfulness awareness, and well-being, significantly predicted math anxiety, $F(4, 7) = 62.31, p < .001$, $R^2 = .97$. Mindful presence and awareness significantly predicted negative affect, $F(2, 10) = 10.71, p = .003$, $R^2 = .68$. In addition, Emotion regulation (cognitive reappraisal) was a significant predictor of mindful presence, $F(1, 11) = 52.27, p < .001$, $R^2 = .83$, accounting for 83% of the variability in mindful presence.

Finally, a stepwise multiple regression was conducted with emotion regulation, mindfulness presence, and mindful acceptance as independent variables and well-being as the dependent variable. At the first step, mindfulness presence significantly predicted well-being, $F(1, 11) = 84.50, p < .001$, $R^2 = .89$, accounting for 89% of the variability in well-being. At the second step, emotion regulation was entered into the model as a predictor of well-being, $F(1, 11) = 81.65, p < .001$, $\Delta R^2 = .06$, accounting for an additional 6% of the variability in well-being.

Discussion

The goal of this research was to determine whether podcasting mindfulness exercises on iTunesU would facilitate mindfulness practice and reduce anxiety related to math; however, this hypothesis was not supported. There was no difference in math anxiety between the participants who were provided with podcasts of mindfulness exercises on iTunesU and participants who were provided with only the book and audio CD. Therefore, the electronic mindfulness resources do not appear to facilitate individual mindfulness practice in the present sample. However, the correlations revealed that math anxiety was negatively related to cognitive reappraisal, mindfulness presence, acceptance, awareness, and well-being. A second finding is that this study
failed to replicate preliminary findings, as there was no significant decrease in math anxiety following four weeks found with the larger sample. A third finding is that there were significant improvements in mindfulness presence and awareness after four weeks of mindfulness practice, and positive gains in well-being, which is consistent with past work (Greeen, 2009).

The results showed close associations between emotion regulation, mindful presence, mindful acceptance, and psychological well-being. Although cognitive reappraisal predicted mindful presence, mindful presence accounted for the majority of the variability with well-being, whereas emotion regulation accounted for only a relatively small proportion of the variance in well-being. Individuals with higher levels of mindfulness presence also reported higher levels of well-being. The third finding is consistent with past research showing that relatively brief mindfulness practice has beneficial effects (Harnet et al., 2010; Tang, et al., 2007). In the current study, participants practice logs revealed that few students sustained daily mindfulness practice on their own outside the weekly meetings and suggests the beneficial effects of mindfulness may be obtained after only four, 20-minute guided meditations once a week. Daily mindfulness practice over several weeks may be necessary to sustain these benefits over time.

There were several limitations to the present study. First, the main goal of this study was to deliver mindfulness exercises and resources directly to students as podcasts on iTunes U to download directly onto any electronic device (e.g., personal computer, smartphone, iPod, iPad); however, only half of the students in sample two attempted to use the electronic resources provided. Self-reports revealed that only two students participants accessed iTunesU on their smartphones and one student accessed the mindfulness podcasts from the PI’s faculty website. Therefore, the study was not able to accurately assess the efficacy of web-based mindfulness training (e.g., Gluck & Maercker, 2011). Rather, the present study suggests that podcasts of
mindfulness exercises may best be used as a supplement to weekly, guided meditations with an instructor. An additional limitation is that many participants found it difficult to attend all of the weekly meetings over 6 weeks and most students did not regularly practice mindfulness daily.

In conclusion, this research showed that relatively brief guided meditation practice can lead to improved mindful presence, acceptance, and psychological well being. The direct benefit to students is that by practicing mindfulness over a period of weeks they learned how to be more present and accepting, which contributed to their overall well-being and may carry over into other areas of their lives. This SAIF award allowed the PI to continue training in MBSR, and expand his research to include emerging technologies such as podcasting and iTunesU. These activities have contributed to my professional development and have allowed me to continue to learn and grow as a teacher and share my meditation experiences with students. This project was a valuable experience from beginning to end.
References


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Mindfulness-based stress reduction lowers psychological distress in medical students. Teaching and Learning in Medicine, 15, 88-92.

Table 1

Correlations between measures of math anxiety, emotion regulation, mindfulness, and well-being following four weeks of mindfulness practice

<table>
<thead>
<tr>
<th></th>
<th>Reappraisal</th>
<th>Presence</th>
<th>Acceptance</th>
<th>Awareness</th>
<th>Neg Affect</th>
<th>Well-being</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math Anxiety (A-MARS(^1))</td>
<td>-.74**</td>
<td>-.68*</td>
<td>-.57*</td>
<td>-.66*</td>
<td>.73**</td>
<td>-.70**</td>
</tr>
<tr>
<td>Cog Reappraisal (ERQ(^2))</td>
<td>.91*</td>
<td>.86**</td>
<td>.38</td>
<td>-.77**</td>
<td>.93**</td>
<td></td>
</tr>
<tr>
<td>FMI(^3)-Presence</td>
<td>.89**</td>
<td>.17</td>
<td>-</td>
<td>-.82**</td>
<td>.85**</td>
<td></td>
</tr>
<tr>
<td>FMI-Acceptance</td>
<td>.08</td>
<td>-</td>
<td>-.67*</td>
<td>.94**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FMI-Awareness</td>
<td></td>
<td>-</td>
<td>.53</td>
<td>.25</td>
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</tr>
<tr>
<td>Negative Affect</td>
<td></td>
<td>-</td>
<td></td>
<td>-</td>
<td>-.67*</td>
<td></td>
</tr>
</tbody>
</table>

Note. \(^1\)Abbreviated Math Anxiety Rating Scale, \(^2\)Cognitive Reappraisal Scale of Emotion Regulation Questionnaire, \(^3\)Freiberg Mindfulness Inventory. *p < .05, **p < .001.