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Effects of Mindfulness on Anxiety in a Sample of College Students

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Abstract: This semi-experimental study evaluated the effectiveness of mindfulness training on reducing anxiety in a sample of college students. Thirty-three participants attended six weekly mindfulness sessions and participated in pre-tests and post-tests for their mindfulness and anxiety levels. The findings showed a significant increase in mindfulness between the pre and post-testing based on the paired sample *t*-test, $t(29) = -5.78, p < .001$) and a significant decrease in anxiety between both tests $t(29) = 6.44, p < .001$. The effect sizes for mindfulness ($d = 1.06$) and anxiety ($d = 1.14$) exceeded Cohen's convention for a large effect ($d = .80$). The research findings show that mindfulness training sessions can successfully reduce anxiety, inviting colleges and universities to offer workshops and mindfulness courses to reduce stress and anxiety in their student populations.

Keywords: mindfulness, anxiety, experimental design, mindfulness training, college students

Introduction

Previous studies suggest that mindfulness can positively impact mental health by reducing psychological distress and increasing self-awareness. For instance, a study by Joyce et al. (2010) indicated a significant decrease in depression and stress for those who participated in a set of mindfulness sessions. Another study used convenience sampling of 315 participants, looked at prior meditation experience in Taiwanese adults found that those with previous meditation experience exhibited higher emotional intelligence levels and perceived less stress than those with lesser or no meditation experience (Chu, 2010).

Godfrin, & Heeringen (2011) examined the effectiveness of mindfulness-based cognitive therapy (MBCT) on the relapse of depression and several mood states and participants' quality of life. The MBCT is a treatment program designed based on The Mindfulness-based Stress Reduction (MBSR) program developed by Jon Kabat-Zinn and colleagues. The researchers selected 106 recovered depressed patients with a history of at least three episodes of depression. The total study period was 56 weeks and examined relapse/recurrence in depression, meeting DSM-IV-TR criteria for a major depressive episode, and the time to relapse since study participation. The study also showed a significant decrease in depressive symptoms in the experimental group from baseline to post-assessment, while the control group showed no significant reduction. In addition, participants who attended the mindfulness therapy sessions showed a significant decrease in depressive symptoms and anger and increased strength than the control group. Although Godfrin & Heeringen's study focused on depression, the outcomes can be applied to anxiety, considering the strong linkages between both mental health factors.

A study of eleven eligible subjects participated in a major academic medical center. They completed measures of anxiety, worry, depressive symptoms, mood states, and mindful awareness in everyday life at baseline and end of treatment. Mindfulness-based cognitive therapy (MBCT) was used in the treatment process. The study showed significant reductions in anxiety and depressive symptoms after treatment (Evans et al., 2008).

Similarly, a web-based mindfulness treatment study looked at the effects of the MBSR program in a group setting for individuals diagnosed with anxiety disorders. Ninety-one participants were randomly assigned to a mindfulness treatment group or online discussion as a control group. Ninety-six guided mindfulness audio files of various instructions were used in the treatment. The results showed a significant reduction in anxiety, depression, and insomnia. Cohen's d for anxiety was ($d=1.33$) for the mindfulness group and ($d= 0.76$) for the control group. Depression effect sizes were also large in the treatment group ($d = 1.58$) and minor to moderate in the control group ($d = 0.49$ and 0.76). The treatment group also improved significantly compared to the control group based on the Insomnia Severity Index (Boettcher et al., 2014).

The current research study builds on the encouraging results highlighted in previous studies (e.g., Boettcher et al., 2014; and Evan et al., 2008) using a quasi-experimental design to measure the impact of a mindfulness intervention on reducing anxiety levels in a sample of college students. In addition, the study also hypothesizes the existence of an inverse correlation between mindfulness and anxiety, as was shown in some previous studies that examined this relationship (e.g., Cernetic, 2016; Soysa & Wilcomb, 2013).

Current Study

This study measured the effectiveness of the mindfulness training offered to students by the Center for Transformative Social Change (CTSC) and the Gatehouse at Humber College in Toronto. The training included meditation procedures that aim to increase one's attention to the present experience of their surroundings on a day-to-day basis. It addresses feelings of anxiety and work-related stress by building trust and connection with one's surroundings and empowering individuals through the expression of creativity and resiliency.

Methodological Procedure

The repeated measure design was used to measure the effectiveness of mindfulness intervention training in reducing anxiety and increasing mindfulness in a sample of college students. The training was composed of six workshops. The first one focused on explaining the philosophy of Mindfulness, Neuroplasticity, and Ba Duan Jin's physical movements. Session two through six were all related to the mindfulness practices and reflection integrating it with the other streams mentioned above. Each session lasted approximately ninety minutes. Various breathing techniques were used, including breath counting, abdominal breathing, stimulating breathing, mindful breathing that focuses on muscle relaxation techniques, and breathing techniques associated with Ba Duan Jin's physical movements. Meditation practices were combined with relaxation music. Sessions usually started with welcoming, centering, then introducing the week's topic, followed by selected activities such as body scan, acceptance of thoughts and feelings, acceptance of anxiety and social anxiety, and more.

Flyers were posted in the Faculty of Social and Community Services at Humber College to recruit participants to the mindfulness training sessions. All interested students were invited to attend an orientation session that provided detailed information about the study's purpose, the mindfulness training, and logistical information.

Thirty-three students joined the mindfulness sessions after getting detailed information about the objectives, confidentiality, anticipated risks, research instruments, and withdrawal procedures, which were all described on the consent form all participants were required to sign before the first

session. Participation packets containing the training information were also given to the participants.

To identify which pre and post-tests were paired without identifying participants, 40 numbers were written on slips of paper and placed in a box. Participants were asked to choose a random number from the box and write it on the back of the first page of their participation packet handed to them on the first day of the training and email it to themselves. During the final week, participants wrote the same number on their post-test so they could be matched for analysis.

Participants filled out the pre-test survey at the beginning of the training on the 24th of January, 2017, which took approximately 1015 minutes to complete. The post-test survey was administered at the end of the sixth session in April 2017.

The hypothetical experimental design was based on measuring mindfulness and anxiety among participants before and after the mindfulness training sessions. The differences between the first and second measurements could then be attributed to the exposure to training sessions.

Instruments

The survey included two existing scales: The Mindful Attention Awareness Scale (MAAS) to measure the level of mindfulness, and the ZUNG Self-Rating Anxiety Scale (SAS) to measure anxiety level.

The mindfulness scale (MAAS) is a 15-items using a 6-point Likert scale (1 = almost always; 6 = almost never). It is designed to assess a core characteristic of mindfulness informed by a sensitive awareness of what is occurring in the present (Brown & Ryan, 2003). The scale has been previously validated for use with college students and community adults, $r(58) = .81, p < .0001$ (Brown & Ryan, 2003). Furthermore, Carlson & Brown 2005 found a significant internal consistency of .87 (Cronbach's alpha) in cancer patients. Items used in this scale are suitable for the general public as it does not require expertise to understand. It has been translated into at least five different languages (Miller, 2020), indicating good adaptability, and has good internal reliability (Jermann, et al., 2009). Sample items from the MAAS include, "I could be experiencing some emotion and not be conscious of it until sometime later", and "I rush through activities without being really attentive to them."

The SAS is designed to measure levels of anxiety in individuals who may have anxiety-related symptoms, focusing on the general symptoms of anxiety disorders. The scale includes 20 items using a 4-point Likert scale to indicate how often certain anxiety symptoms are felt (1 = A little of the time, 4 = Most of the time). Total raw scores, therefore, range from 20 to 80. Fifteen items express a negative experience, such as "I feel afraid for no reason at all," and five express a positive experience and are reverse-scored, such as "I can breathe in and out easily." Previous studies that tested the SAS scale have indicated good internal consistency with a Cronbach's alpha of .82 (Dustan et al., 2017).

Statistical Methods

The total scores of MAAS and SAS were computed for the pre and post-test for each participant. The paired sample *t*-test was used to compare the scores before and after the mindfulness intervention. Pearson coefficient (*r*) was also used to check the correlation between MAAS and SAS scores before and after the intervention.

Results

Of the 33 study participants, 29 identified as females, which corresponds to 87.9% of the total sample. Only three identified as male (9.1%), and one person (3%) did not identify with either. All participants were from the Faculty of Social and Community Services. Their average age was ($M = 20$; $SD = 2.1$). Thirty out of the 33 students participated in both the pre and post-test. Students who did not submit both surveys were not included in the analysis, leaving a final sample size of $n = 30$.

The distributions of MAAS and SAS scores were tested for normality prior to further analysis. The calculated skewness and kurtosis values for the mindfulness scores were (-0.81 and -0.69), and for anxiety scores, they were (1.01 and 1.9). These fall within the allowable limits to be considered normal for the *t*-test (skewness < 2.0 and kurtosis < 9.0), as based on the general rule mentioned in Posten (1984). The skewness and kurtosis outcomes indicate that the differences between pre- and post-tests for both variables are normally distributed. The correlations between the pre and post-test scores were ($r = 0.4$, $p < 0.05$) for the mindfulness tests and ($r = 0.56$, $p < 0.001$) for the anxiety tests, which suggests that the paired sample *t*-test is appropriate for the data.

Mindfulness scores increased from a mean of 43.03 on the pre-test ($SD = 9.61$) to a mean of 54.5 ($SD = 10.19$) on the post-test. The paired *t*-test indicated that the mindfulness training used in the study resulted in a significant improvement in mindfulness scores, $t(29) = -5.78$, $p < .001$. The effect size of this improvement was $d = 1.06$, exceeding Cohen's (1988) convention for a large effect ($d = .80$; Kotrlik et al., 2011).

Anxiety scores increase from a mean of 42.26 on the pre-test ($SD = 9.63$) to 33.03 on the post-test ($SD = 6.9$). The paired *t*-test indicated that the mindfulness training used in the study resulted in a significant decrease in anxiety levels among participants $t(29) = 6.44$, $p < .001$. The effect size of this reduction was ($d = 1.14$), also qualifying as large by Cohen's 0.8 threshold. Table 1 summarizes the paired sample *t*-test results.

Table 1

T-test Results for MAAS and SAS tests before and after the intervention (Mindfulness Training).

Variables	N	Before the	After the	t (df)	p	d
		Mindfulness Training	Mindfulness Training			
Mindfulness MAAS	30	M(43.03, SD 9.61)	M(54.50, SD 10.19)	-5.78 (29)	.000**	1.06
Anxiety SAS	30	M(42.26, SD 9.63)	M(33.03, SD 6.90)	6.44 (29)	.000**	1.14

Note. ** $p < .001$

The correlation analysis between mindfulness and anxiety before and the intervention showed a significant negative relationship, $r(28) = -0.59$, $p < .005$, and even stronger negative relationship after the intervention, $r(28) = -0.62$, $p < .001$. This is consistent with the results from previous studies (e.g. Cernetic, 2016) that showed a well-established inverse correlation between these mentioned variables.

Limitations

Several limitations exist in this study that warrant further research to address:

1. Nearly all of the participants were female, which does not provide gender balance that is probably needed to generalize the effectiveness of the mindfulness sessions beyond women.
2. All participant students were from the Faculty of Social and Community Services as the training sessions' schedule did not fit the schedules for students from other schools and programs. It would be beneficial to measure the effects of mindfulness training on students from different kinds of academic schools and programs.
3. The study included an experimental group only, and there was no control group to account for possible factors such as regression to the mean or placebo effects. Comparing improvement between an intervention group and a control group receiving some other generic pseudo-intervention or none at all could yield more definitive conclusions.

Discussion

As discussed in the introduction, the literature on the effect of mindfulness on mental health indicates multiple positive applications for mindfulness in reducing psychological strain. Keng et al., (2011) examined three empirical research areas: correlational research, intervention research,

and laboratory-based experimental research, and found that mindfulness is positively associated with psychological health. They concluded that mindfulness training brings positive psychological effects for participants of various age categories.

The current study provides further evidence for the impact of mindfulness training in alleviating anxiety through improved mindfulness. The effect sizes for mindfulness ($d=1.06$) and anxiety ($d= 1.14$) were found to exceed the large effect ($d = .80$) based on Cohen's d general rules and very consistent with the large effect size of $d = 1.33$ reported in Boettcher's study for anxiety reduction in the experimental mindfulness group (Boettcher et al., 2014).

Overall, the research outcomes are consistent with the findings of the literature (e.g. Evans et al., 2008; Chu, 2010; Boettcher et al., 2014; Parmentier et al., 2019; Hofmann et al., 2010) that reported a significant reduction in anxiety and other negative mental health factors after mindfulness intervention.

Skewness and kurtosis are rarely indicated in previous studies due to the small size of samples taken in such type of experimental studies. The normal distribution indicators for data calculated in this study may bolster the generalizability of the outcomes.

Furthermore, the study indicated a negative correlation between anxiety and mindfulness for both the pre-test and the post-test. This is in line with results from previous studies (e.g., Chu, 2010; Boettcher et al., 2014; and Parmentier et al., 2019). A possible functional explanation for this relationship is provided by a neuroimaging study by Taren et al. (2015) that suggests mindfulness training promotes functional neuroplastic changes in the brain, offering an amygdala pathway for stress reduction effects. Individuals who tend to have higher mindfulness level are more likely to develop better coping strategies with stress and anxiety (Cernetic, 2016). However, the literature on the relations between anxiety and different facets of mindfulness is still unclear and requires further research investigation (Cernetic, 2016). For example, Cash and Whittingham (2010) found that only one out of five facets of mindfulness (nonjudging) predicted a lower level of anxiety, depression, and stress while the rest (observe, describe, act-aware, and non-react) did not.

Conclusion

This study provides evidence for the effectiveness of mindfulness sessions in reducing anxiety. The statistical evidence generated from this study and previously published studies may encourage colleges and universities to offer workshops and mindfulness courses to reduce stress and anxiety in their student populations.

According to several studies regarding mental health in the student population, stress and anxiety are common in college and university students (e.g., Asif et al., 2020; Chernomas & Shapiro, 2013; & Saul & Fish, 2019).

Adding mindfulness courses or practices within a designed curriculum related to mental health and counseling would likely benefit this population. Raising awareness in the general population through workshops or symposiums hosted by the academic institutions and community centers would increase the level of knowledge regarding mindfulness and could lead to better mental health in the general population.

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Ethics statement

Ethical approval for the study was received from the research team's university's ethics committee, and complied with the Declaration of Helsinki (Approval number =RP-0181).

Conflict of Interest

There is no conflict of interest.

Availability of data and materials

Data will be made available upon reasonable request.

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Authors' contributions

All authors significantly contributed to the preparation of this manuscript.

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