Student registered nurse anesthetists (SRNAs) experience high levels of stress related to the level of difficulty and time commitment associated with an integrated Doctor of Nursing Practice anesthesia program. Although some degree of stress is necessary for motivation, unmanaged stress can contribute to illness, dissatisfaction, and substance use. A search of the literature showed that mindfulness meditation training reduces stress and improves academic performance in graduate student populations. An evidence-based practice project was developed and implemented to provide SRNAs with a novel stress management mechanism. A guided mindfulness meditation application for smart phones (Headspace, Headspace) was chosen as the intervention modality. Research shows that this application is an effective and convenient delivery system for mindfulness meditation training, decreasing stress during a 10-day trial. SRNAs attended a mindfulness presentation and completed an introductory guided mindfulness meditation module using the Headspace application on their personal smart phone. Preintervention and postintervention surveys (N=33) using the Depression Anxiety Stress Scales 21-item questionnaire were analyzed using the Wilcoxon signed rank test. Results showed significant reductions (P<.01) in depression (Z=−3.36), anxiety (Z=−3.07), and stress (Z=−3.46) scores, representing reductions of 32%, 32%, and 47%.

Keywords: Anesthesiology, mindfulness meditation, nursing students, stress, student registered nurse anesthetist.
gap in an integrated nurse anesthesia program, we used the Lazarus Theory of Stress, Coping, and Adaptation to develop an EBP project to deliver mindfulness meditation training to SRNAs. The goals of the project were to reduce overall stress in SRNAs, provide SRNAs with an introduction to mindfulness meditation, and introduce a form of mindfulness meditation training that has been shown to be effective in reducing stress.

Review of Literature

A literature review was conducted to assess the efficacy of mindfulness meditation in the mitigation of stress in SNRAs. The literature review was conducted using the research databases Scopus, PubMed, and Cumulative Index to Nursing & Allied Health Literature (CINAHL). The following keywords were used in the search: mindfulness, anxiety, meditation, and graduate student. Inclusion criteria included peer-reviewed articles written in English, scoring level III or higher on the Johns Hopkins Nurse Evidence-based Practice (JHNEBP) Rating Scale, and a sample population comparable to SNRAs. Exclusion criteria included articles that were below level III on the JHNEBP rating scale and articles in populations other than those identified as comparable populations to SNRAs. Ten articles met the inclusion criteria (Table). Additionally, 1 systematic review of the literature pertaining to health science graduate students was identified, and that review identified 8 articles on this subject. No articles were found on the effects of mindfulness meditation specific to the SRNA population, although articles were found in populations comparable to SNRAs. The literature on this topic was not well developed; there is a need for randomized controlled trials and prospective designs. Additionally, most studies on this subject relied on participant self-reports.

- **Mindfulness Meditation as a Stress Reduction Tool.** Mindfulness meditation was found to be an effective stress reduction tool in all 5 studies that directly tested this metric. These studies included medical students, pharmacy and allied health students, and a randomized controlled trial with undergraduate, graduate, and professional students. Mindfulness meditation enabled students to maintain their current stress level, effectively curbing increases in stress compared with the control group whose stress levels increased over time. Mindfulness meditation programs are beneficial to both graduate and undergraduate students and help manage stress, which was shown to lead to a decrease in anxiety.

- **Mindfulness Meditation Effects on Stress-Related Complications.** Mindfulness meditation may decrease stress-related complications. Correlations have been found between baseline mindfulness meditation levels, depression, and suicidal ideation. One study found that there was a decreased level of suicidal ideation among undergraduate women scoring higher on a mindfulness meditation questionnaire as opposed to those who had lower scores. The researchers concluded that teaching mindfulness meditation techniques to college students who experience stress and depression may reduce the risk of suicide. Mindfulness meditation was found to outperform exercise, a common nonpharmacologic strategy for depression. Although both exercise and mindfulness meditation were found to reduce symptoms of depression, mindfulness meditation was superior to physical exercise among nursing students.

- **Long-term Effects of Mindfulness Meditation Training.** The long-term effects of mindfulness meditation training on healthcare providers has not been well studied. The longest follow-up in the reviewed randomized controlled studies was 3 weeks after the intervention and did show retention of reduced anxiety levels. Only one identified study examined the long-term effects but did not measure mindfulness meditation or anxiety of the participants. This study examined the long-term use of mind-body medicine skills in residents, fellows, and clinicians 0 to 10 years after graduation from medical school. These physicians were enrolled in a mind-body medicine course during their time in medical school and mindfulness meditation training was a covered topic. More than half of the physicians continued to use these techniques after graduation. This suggests that mindfulness meditation may continue to be used as a positive coping mechanism for career stress in the medical profession. This is promising for the use of mindfulness training.

Table. Articles With Sample Populations Similar to Student Registered Nurse Anesthetists

<table>
<thead>
<tr>
<th>Sample population</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthcare students: pharmacy and allied health</td>
<td>Barbosa, et al, 6 2013</td>
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<tr>
<td>Medical students</td>
<td>Phang et al, 7 2015</td>
</tr>
<tr>
<td>Undergraduate students</td>
<td>Hindman et al, 8 2015; Greeson et al, 9 2014; Samp et al, 10 2017</td>
</tr>
<tr>
<td>Undergraduate women</td>
<td>Anastasiades et al, 11 2017</td>
</tr>
<tr>
<td>Nursing students</td>
<td>Alsaarireh &amp; Alousch, 12 2017</td>
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<tr>
<td>Physicians</td>
<td>Staffaroni et al, 13 2017</td>
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<tr>
<td>New emergency department nurses</td>
<td>Economides et al, 14 2018</td>
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<tr>
<td>Novice pediatric nurses</td>
<td>Morrison Wylde et al, 15 2017</td>
</tr>
<tr>
<td>Mental health professionals</td>
<td>Rudaz et al, 16 2017</td>
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meditation training in SRNAs since, “during their educational experience, SRNAs begin to establish patterns of responding to stressors that they may take with them into their professional lives.” If mindfulness meditation training is established during SRNAs’ education and they find it to be a useful stress management technique for themselves, they may be more likely to use it in their career, potentially reducing their risk of maladaptive stress management techniques.

- Mindfulness Meditation Training Modalities. The reviewed studies implemented several different modalities of mindfulness meditation training. All studies showed that mindfulness meditation training, regardless of modality, was effective in reducing anxiety and increasing mindfulness. The students participating in the smart phone group using Headspace (Headspace) found that it was equally effective as in-person mindfulness training. This is important, as this intervention is scalable and could potentially reach more people by elimination of limiting factors such as class size, teacher availability, and scheduling conflicts among participants. It is notable that smart phone application was less effective than in-person training for participants exhibiting signs of post-traumatic stress disorder.

- Lazarus Theory of Stress, Coping, and Adaptation. Mindfulness meditation as an intervention for stress reduction can be understood more clearly when one considers the Lazarus Theory of Stress, Coping, and Adaptation. This theory describes stress as a process involving 3 unconscious appraisals of stressors: the primary appraisal where the initial judgment about an event is made, the secondary appraisal where the individual assesses his or her response to the event, and the third appraisal or reappraisal in which the event is continuously and dynamically reassessed as it develops. Stress is experienced during the appraisal process if an individual feels that he or she cannot deal with the event or has not responded appropriately. Mindfulness meditation training serves as a lens to better view and understand both actions and emotions. It helps to increase awareness of the present and increases focus, which helps to reduce false assumptions due to lack of situational awareness. This may be why higher levels of mindfulness meditation result in less stress. Additionally, it helps to quiet the noise of errant thoughts and decrease the focus on future stressors such as an upcoming test or perceived challenging clinical experience. Mindfulness-based therapy was originally developed as an adjunct for treating major depressive disorders and has been shown effective in reducing depressive symptoms and preventing relapse of depression.

Methods
This project was implemented at a university DNP anesthesia program. The institutional review board determined this project to be exempt from its oversight. Study data were collected and managed using Research Electronic Data Capture (REDCap) tools. REDCap is a secure, web-based software platform designed to support data capture for research studies.

Participants were invited via email to a presentation called Introduction into Mindfulness Meditation for Stress Management. Email invitations included a link to a preintervention survey through REDCap. This survey included demographic information, previous mindfulness meditation experience, and a standardized stress scale. Each survey participant was also asked to create a unique user code so that individual preintervention and postintervention surveys could be compared. Lunch was provided by the College of Nursing to increase attendance. Seventy-one of 74 SRNAs who were enrolled in the program attended the presentation. The presentation consisted of an overview of mindfulness meditation and an introduction to the application Headspace. Attendees were invited to participate in the project and asked to complete the 10-day free trial offered by Headspace, over the course of the next 10 days, after which a postintervention survey was sent to all participants. The first session was done together as a class to familiarize the participants with the software. Over the course of the trial period, reminder emails were sent to participants to encourage the completion of the daily guided meditation.

Headspace is a guided mindfulness meditation training platform available on smart devices and online. It offers a free introductory 10-day basics course in mindfulness meditation as well as a subscription service with categories of guided meditation courses. Courses, including the 10-day basics course, include an audio recording that instructs the user through a 10-minute meditation session. The 10-day basics course is targeted at individuals with limited or no experience with meditation and is supplemented by instructional videos that provide context and background for each meditation session.

The Depression Anxiety Stress Scales 21-item (DASS-21) questionnaire was chosen as the standardized stress scale because of its tested validity and reliability, its relatively short format, its availability in the public domain for free use and reproduction, and its efficacy in measuring the negative emotional states of depression, anxiety, and stress. The DASS-21 is a combination of 3 self-report scales: 1 measuring depression, 1 anxiety, and 1 stress. This instrument allows separate measurements of each scale. The scales of the DASS-21 were chosen because they have been shown to have a “high internal consistency and to yield meaningful discriminations in a variety of settings; the scales should meet the needs of both researchers and clinicians who wish to measure current state or change in state over time (eg, in the course of treatment) on the three dimensions of depression, anxiety and stress.” This scale was used to assess the effectiveness of the use of Headspace as an emotional
wellness tool for SRNAs and to determine if there was a significant decrease in the metrics of depression, anxiety, and/or stress after the intervention. This scale was distributed to participants via pre- and postintervention surveys to complete before the intervention and after the 10-day intervention period. The DASS-21 manual provides a scoring scale that delineates results in each of the 3 categories of depression, anxiety, and stress as normal, mild, moderate, severe, or extremely severe.

Preintervention and postintervention survey responses were matched via unique user code and were compared. A single-tailed $t$ test was used to assess for a significant decrease in depression, anxiety, and stress. DASS-21 scores were compared for each individual and then averaged to assess for overall reduction in each metric.

Postintervention surveys also included application usage questions to assess for participant engagement with the intervention. Questions included average sessions completed and average minutes meditated. The postintervention surveys also included questions to gauge participants’ plan to continue using mindfulness meditation after the end of the project. These questions included: “Do you intend to continue using some form of mindfulness meditation? (yes/no),” “If yes, in what way do plan to continue using mindfulness meditation in the future? (using the Headspace application, self-practice, using other guided meditation applications, using free sources such as other guided mindfulness meditation applications or YouTube videos, or none of the above)?”

**Results**

The introductory lecture was attended by 71 of 74 SRNAs enrolled in the DNP Nurse Anesthesia Program. Of the 74 preintervention surveys distributed, 53 (71.6%) were completed. Postintervention surveys were sent to all 74 SRNAs after the completion of the intervention; of those, 43 were completed. Thirty-three matched preintervention and postintervention surveys were completed by participants. Survey results showed that 22 (66.6%) of these 33 participants had minimal to zero previous meditation experience. Usage questions in the posttest revealed the average number of sessions completed was 6.5 of 10, and when all sessions were combined, the total average time mediated was 51.2 minutes. A Wilcoxon signed rank test showed significant reductions in depression ($Z=−3.36$, $P<.01$), anxiety ($Z=−3.07$, $P<.01$), and stress ($Z=−3.46$, $P<.01$) scores.

The results of the DASS-21 questionnaire were categorized as normal, mild, moderate, severe, and extreme. In the category of depression, a 32% reduction was seen (Figure). Based on the scoring key of the DASS-21 questionnaire, the participants’ average preintervention score for depression was 13.6, which is categorized as mild to moderate. This score was reduced to 9 in the postintervention survey results, which is categorized as normal. In the category of anxiety, a 32% reduction was also seen. The average anxiety score on the preintervention survey was 18.3, which is categorized as severe. In the postintervention survey the average score was 12.4, which is categorized as moderate. In the category of stress there was an average reduction of 47%. The average preintervention score for stress was 11.3, which is categorized as normal. The average postintervention stress score was 6, also categorized as normal.

On postintervention survey items pertaining to planned continuation of mindfulness meditation training, 41 (95%) of 43 participants indicated that they intended to continue practicing some sort of mindfulness meditation after the conclusion of the project. Nineteen of 43 survey respondents (44%) reported they planned to continue using the application Headspace. With multiple responses allowed, 27 of 43 (63%) planned to continue mindfulness meditation with self-practice, 9 of 43 (21%) planned to continue with other guided meditation apps, 14 of 43 (33%) planned to continue mindfulness meditation with the use of YouTube videos, and 2 of 43 (5%) planned to continue with another method.

**Discussion**

Mindfulness meditation has been found to increase academic performance and reduce test anxiety. Although no evidence was found during the literature review to support the translation of these benefits directly into the clinical setting, it has been noted that unmanaged stress can contribute to illness, burnout, dissatisfaction, and substance use. It may be extrapolated from these facts that SRNAs may be more prepared in the clinical setting if they perform better academically and may also be less likely to divert medications if they are better at managing stress. Additionally, researchers found that more than 50% of surveyed graduates who had attended a mindfulness meditation course during their studies continued to use mindfulness meditation techniques throughout their careers. Continued stress management with the

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**Figure.** Student Registered Nurse Anesthetists’ Depression, Anxiety, and Stress Scores Before and After Mindfulness Meditation Intervention

![Depression, Anxiety, Stress Scores](chart.png)
potential to reduce the prevalence of impaired providers constitutes an improvement to patient safety.

As shown by the results of this project, there was a significant decrease in all measured negative emotional states after the mindful meditation intervention. Depression and anxiety scores were significantly decreased. Depression scores normalized. Anxiety scores changed from severe to moderate. A 47% reduction in stress was found in this project. This reduction in stress was higher than in a similar study, the results of which found a 14% stress reduction in participants using the 10-day trial offered by the Headspace app. These results indicate that the intervention was successful in achieving the goal of this project, which was to give SRNAs an effective stress reduction technique. The short time required to achieve these results, averaging 51.2 minutes total over 10 days, also achieves the goal of a time-conscious stress reduction strategy.

There are several limitations to this study. These study participants could be experiencing more stress than the average Headspace user, which could account for the larger reduction in stress. Furthermore, there was no control group. This project was conducted in a setting of peers of the project director (J.L.-R.), and they were aware of the goals of the project, which may have led to the Hawthorne effect. Participants may have overreported stress on the pretest and underreported it on the posttest to “help” ensure a positive result. This project needs to be replicated in a setting that does not include the project director’s peers. This may reveal whether there was a level of bias in the results of this project.

Conclusion
The current literature shows that mindfulness meditation is an effective stress reduction tool.6-9,16 Mindfulness meditation has also been shown to have several positive academic benefits, such as reduced test anxiety and better grade point averages.10 Because mindfulness meditation is currently underutilized and shown to be beneficial, we developed an education program to deliver mindful meditation training to SRNAs. The goals of the project, which included reducing overall stress in SRNAs, providing SRNAs with an introduction to mindfulness meditation, and introducing a form of mindfulness meditation training, were achieved. The use of mindfulness meditation as a coping mechanism was found to be effective in this population. Significant decreases in depression, anxiety, and stress were observed in SRNAs.

REFERENCES


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