The Impact of Mindfulness Training on Middle Grades Students’ Office Discipline Referrals

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Abstract
Young adolescents who experience stress may also exhibit negative behaviors at school. Students whose misbehavior causes an interruption to classroom learning may be sent to the office and, as a result, lose instructional time and learning. The goal of this quasi-experimental pilot study was to determine if mindfulness training would decrease the number of office discipline referrals for middle grades students with a high number of office discipline referrals. The treatment required students to use a Muse brain-sensing headband paired with an app to train them to focus on calming and self-regulating behaviors. Data analysis indicated a statistically significant correlation between using the headband for 3 min a week and a lower number of times students were sent to the office for behavior redirection. Research with a larger sample size is recommended.

Introduction
Stress can be defined as a physiological response to the perception of loss of control resulting from an adverse situation or person (Jensen, 2009). Early research on adolescent students and school-related stress indicates that students may experience stress in the areas of adjustment, performance, and behavior (Windle & Windle, 1996). Contemporary studies detail more specific stress-inducing factors that, according to Broderick and Jennings (2012), include...

...disengagement from school, alienation from parents, body image self-consciousness, susceptibility to peer influence, pressure to engage in sexual activity and romantic relationships, participation in antisocial or risky behaviors, and heavy exposure to media that may mold behavioral expectations at odds with the values of their families and communities. (p.112)

Students in poverty may experience stress more often and more intensely than their affluent peers (Almeida, Neupert, Banks, & Serido, 2005). Military-connected
students also contend with the psychological stress and emotional issues related to moving an average of six to nine times during their schooling, and the reality and threat of parental deployment (Chandra, Hawkins, & Richardson, 2010; Petty, 2009; Phelps, Dunham, & Lyons, 2010).

Students’ stress levels may manifest in anger, poor behavior, violent behavior, and poor classroom conduct particularly at the secondary level (Feindler, 1995; Ommundsen & Vaglum, 1991; Prins & Hanewald, 1999). According to the most recent indicators of school crime and safety report (based on 2007–2008 data), a high percentage of secondary school teachers reported that student misbehavior interfered with teaching and learning in their classrooms (National Center for Educational Statistics [NCES], 2009). Students whose misbehavior causes interruption to classroom learning may find themselves subsequently being sent to the office for behavior redirection by a teacher seeking additional support from a counselor, social worker, or administrator. Such trips to the office can have additional negative effects for students due to classroom absences from valuable learning time (Scott & Barrett, 2004).

Alternatives to office discipline referrals for behavior redirection may positively influence student behavior (Durlak, Weissberg, Dymnicki, Taylor, & Schelinger, 2011; Pilcher & Poland, 1992). Promising practices include mindfulness, a psychological construct that is defined across the literature as purposefully paying attention to one’s inner and outer experiences, in the present moment (Kabat-Zinn, 2003). Mindfulness can create pathways for students to self-regulate emotion and stress and refrain from impulsive actions (Farb, Anderson, & Segal, 2012; Orter, Kilner, & Zelazo, 2007; Sayers, Creswell, & Taren, 2015). Using mindfulness as a pathway to self-regulation, students could potentially strengthen their ability to avoid overreacting, increase their ability to pay attention, and manage to stay in their classroom learning environment (Zelazo & Cunningham, 2007).

To better understand the effects of mindfulness on student behavior, a pilot study was conducted in a middle school setting. The study investigated whether Muse brain-sensing headbands could be used to guide students through mindfulness training and affect the number of times students were sent out of the classroom for behavior redirection. It was hypothesized that students that benefit from mindfulness training could increase their ability to remain calm and focused, making it unnecessary to be sent out of the classroom for behavior redirection, resulting in missed instructional time.

**Theoretical Background**

For many years, a common approach to stress reduction has been to elicit what Herbert Benson (1975, 2000) termed the “relaxation response.” The relaxation response involves bodily changes when one experiences a focus on breath and relaxation. This response is a naturally occurring measure against overstress, bringing the body back to a healthier balance.

Current literature offers a number of empirical publications in the field of neuroscience using the term “mindfulness” to describe a comprehensive theoretical framework derived of four components that may work to provide a calmer state: (a) attention regulation, (b) body awareness, (c) emotion regulation (including reappraisal and exposure, extinction, and reconsolidation), and (d) change in perspective on the self (Holzel et al., 2011). The incorporation of stress reduction programs, such as mindfulness, into the school curriculum is associated with improvement of academic performance, self-esteem, mood, concentration, and behavior (Ballinger & Heine, 1991; Dendato & Diener, 1986; Kiselica, Baker, Thomas, & Reedy, 1994; Napoli, 2004; Shillingford & Shillingford-Mackin, 1991).

**Mindfulness Training Options**

The correlation between stress reduction and improved academic and behavior performance in adolescents motivated researchers to seek potential tools students could use for guidance into a more concentrative and focused state, resulting in a learner that is able to cope with stressful situations (Langer, 1989, 2000; Beauchemin, Hutchins, & Patterson, 2008; Felver, Celis-de Hoyos, Tezanos, & Singh, 2015). Of the tools considered, one emerged that required very little time or attention from classroom teachers, yet provided students with an opportunity for self-guidance into mindfulness: the Muse brain-sensing headband.

The Muse is a wearable device that senses the electrical rhythms of the brain. Through a Bluetooth connection, the Muse headband works with an app, which can be downloaded to a smartphone, tablet, or computer. When the user participates in a Muse-guided meditation session, it gives spontaneous feedback on brain activities during the session. While practicing with the Muse, the user is required to calm down and focus on respiration. Using the Muse for mindfulness training with adults has been correlated to
improved attention and reduced somatic symptoms, such as headaches, pain, discomfort, stress, and so forth (Bhayee et al., 2016).

To advance understanding in the correlation between mindfulness training and student behavior, a quasi-experimental study was planned and conducted to discover the impact of Muse mindfulness training on students’ behaviors at school. Specifically, the study investigated the relationship between students’ office discipline referrals and Muse scores. It was hypothesized that students’ Muse scores would increase while their office discipline referrals would decrease after 20 Muse practice sessions.

**Methods**

**Participants**
The project used a quasi-experimental matched comparison group design to estimate the impact of guided mindfulness on office discipline referrals. Random assignment of the school student population to groups was not feasible; however, in order to develop comparison groups, school district data management software was queried to generate the following criteria: students in middle grades (7th–8th grade) who averaged five or more office discipline referrals for two consecutive semesters. Twenty students with more than five referrals each were recruited, and their parents signed consent forms. Ten students were randomly assigned to the treatment group and ten were assigned to the control group (N = 10, seven females, three males). One control group student was put on an Individual Learning Plan for special education services, leaving nine students in the control group (N = 9, four females, five males). There were eight eighth-grade students and one seventh-grade student in the treatment group. The control group was comprised of six eighth-grade students and three seventh-grade students.

**Muse Headband and Muse App**
The Muse headband is a wearable device that is able to track brain activity, very similar to the way a heart rate monitor can capture a heartbeat. The user is guided through a calming sequence of his or her choice, either an ocean or a rainforest scenario. The user then is able to get real-time feedback on how calm he or she remained during the guided session. The information is then gathered and stored in the Muse app that the user has downloaded to a smartphone, tablet, or computer. By tracking Muse progress on a personal account, the user is able to monitor progress after each mindfulness training session.

**Procedures**
From October 2016 to March 2017, students in the treatment group each participated in 3 min of guided mindfulness training with a Muse once per week during their eighth class period (a homeroom study period) from 1:55 p.m. to 2:40 p.m. in an assigned, quiet classroom. Two students participated in Muse sessions simultaneously as a graduate research assistant monitored the room. In total, each participant in the treatment group completed 20 Muse sessions. The control group did not participate in any mindfulness training sessions, but data on their office referrals for behavioral redirection were tracked and collected.

Twice each week for the duration of the study, the researcher went on site to the middle school. The researcher’s routine included setting up two desks with a Muse headband and an iPad with the Muse app. The researcher then submitted the participants’ time schedules for Muse practice to the office staff. Each participant was assigned 15 min to leave their homeroom, participate in the Muse session, and return to class.

In the first Muse session, students learned about the Muse devices and the researcher introduced the guided mindfulness training protocol. Students were encouraged to find a comfortable position and were allowed to sit or lie down for the Muse session. Students were briefed on how the Muse works together with Muse app to guide them through 3 min of mindfulness training. Students had their own individual Muse accounts to record their progress.

During their first Muse session, students used earbuds to receive guidance from the app on how to concentrate on their breathing. Nature sounds emitted from the Muse provided students with spontaneous feedback about their brain activity. If a student’s mind stayed deeply restful and calm, they were rewarded with the sound of birds. If the mind was active, the sound of wind or the ocean intensified. After each session, the Muse app displayed the resulting score. Upon completion of the 3-min practice, participants received a piece of candy as compensation. Meanwhile, the researcher recorded students’ Muse scores in a password-protected file.

In subsequent mindfulness training sessions, no one counseled the students or spoke to them, with the exception of a person who acknowledged their arrival and told them to sign in. Students did not speak to each other and rarely arrived at the same time. All students were able to opt out of the study at any time for the duration of the project.
Measures
Brain waves. Brain waves are the electrical activity of neurons across the cortex of the brain that can be recorded via electroencephalography (EEG) (Desai, Tailor, & Bhatt, 2015). The brain generates activity as waves or oscillations that are representative in two states, either active or resting. Within those states, human beings display five types of brain wave classifications: alpha, beta, theta, gamma, and delta. Alpha waves are prominently active when a person is awake, but they are only moderately active when a person is relaxed with eyes closed (Desai et al., 2015). Alpha waves help people to relax and clam down. Beta waves occur during “a heightened state of awareness” when people are alert and concentrating on tasks (Desai et al., 2015, p. 114). Beta activities correlate with academic performance and emotions. Theta waves occur in sleep or deep relaxation and can also relate to the inability to focus; they are prevalent when a person is depressed. Gamma waves are energetic waves and relate to the feeling of strong capability (Desai et al., 2015). Delta waves are generated in a state of extremely deep meditation and dreamless sleep (Berman & Stevens, 2014).

The Muse utilizes the EEG system to investigate neural mechanisms and detect the full range of brain wave activity. The Muse app analyzes the brain signals gathered by the Muse headband and divides the data into three states: calm, neutral, and active (Interaxon, 2017). The headband is placed over the ears and across the forehead. The equipment calibrates by measuring brain waves during two brief exercises: a word association task and a brief focused attention task.

Following a calibration period, the app guided each participant through the nature sounds that would serve as auditory cues as to whether the participant was focused or wandering. These auditory cues also were gamified; participants scored points for maintaining inward focus on their breathing. Hearing a bird flying by indicated to users that they were deeply focused on their breath, which earned them three points for every second under this condition. Every second of a neutral state of mind received one point. The accumulation of points created a final score for each Muse session. The higher the score, the more focused the student was during the Muse practice. The Muse app stored each session score under the student’s individual Muse account.

Office referral records. An office referral occurs when a student’s behavior impacts the learning of other students in a negative way, so much so that learning stops taking place. The middle school research site had a policy and procedure for office referrals. Students misbehaving first received a verbal warning. If the student did not correct the behavior, he or she got a “plan time.” The teacher placed a piece of paper face down on the students’ desk with the word “Warning” printed on the back. If the student did not correct the behavior at that time, then the teacher flipped the sheet face up and the student completed a questionnaire about his or her negative behavior and how he or she would correct it. This form was sent home for parent/guardian signature. If the behavior was not corrected after that procedure, students were sent to the office. If the student’s negative behavior posed an immediate danger to other students or self, the procedure was skipped and the student was sent directly to the office.

The district used a data management software package to keep student records. When a student was referred to the office, his or her information was entered into the data management system and coded for record keeping. Parents/guardians and students had access to student data through a portal that allowed them to see attendance, grades, discipline referrals, and other instances of communication. Office referral data queried from the building data management system was used to determine participants for the matched comparison group design and to estimate the impact of guided meditation on office referrals. Office referral data for students in both the treatment group and the control group were recorded from September 2016 to April 2017.

Results
Muse Scores
Students’ Muse scores were collected for analysis to measure improvement in the students’ ability to be mindful. Muse scores began at zero and had the potential to increase or decrease with each session. Each treatment group participant did 20 Muse sessions, divided across the second and third semesters of the academic year, with winter vacation in between. Thus, Muse scores were grouped into first half scores and second half scores. The students’ average Muse scores increased from 328 to 390 points. The largest individual increase went from 317 to 424 points—an increase of 107 points. The smallest increase was 24 points—from 307 to 331 points. Figure 1 provides data relevant to the first research question regarding Muse scores. It indicates students’
abilities to concentrate during Muse sessions. All students in the treatment group increased their Muse scores.

Office Referral Records

Figure 2 depicts the average number of participants’ office referrals recorded from September 2016 to April 2017. In the Muse treatment group, participants’ office referrals dropped significantly from 6.33 to 1.78. In contrast, students in the control group kept close to their original number of office referrals, but with a slight increase from 4.22 to 4.44.

A paired sample t-test was used to analyze students’ office referrals and to explore whether mindfulness training with the Muse had an impact on student behavior. The study rejected the null hypothesis \( t(8) = 2.37, p = 0.045 < .05 \) and found that there was a statistical significant difference in students’ office referrals after participating in the Muse study. Referrals dropped from \( M = 6.33, SD = 5.05 \) to \( M = 1.78, SD = 1.09 \). Cohen’s \( d = 1.25 \) suggests that mindfulness training with the Muse had a large impact on students’ office referrals.

Additional analysis comparing the Muse treatment group with the control group employed an independent sample t-test to measure whether students who participated in Muse sessions and those who did not were statistically different in their number of office referrals. There was homogeneity of variance as assessed by Levene’s test for equality of variances. The study rejected the null hypothesis \( t(16) = -3.68, p = 0.002 < .05 \), suggesting a statistically significant difference on students’ office referrals between students who participated in mindfulness training with the Muse \( (M = 1.78, SD = 1.09) \) and those who did not \( (M = 4.44, SD = 1.88) \). Cohen’s \( d = 1.73 \) suggested that Muse practices had a very large impact on students’ office referrals.

An analysis of covariance evaluated whether students’ initial office referrals were influenced by mindfulness training. The homogeneity of variance was met by Levene’s test, \( p = 0.17 > .05 \). Students’ initial office referral numbers (covariate in this study) had no significant effect on their behavior at school \( F(1, 15) = 2.58, p > .05 \), which means this covariate did not influence the students’ office referrals in this study. This result demonstrates that the effect of Muse practices applies to any student without regard to his or her former behavior record at school. The study rejected the null \( F(1,15) = 10.47, p = .006 < .05, \) partial Eta squared = .41, and found that students who participated in mindfulness training \( (M = 1.78, SD = 1.09) \) had a smaller number of office referrals than did those students who did not participate in the training \( (M = 4.44, SD = 1.88) \).

![Figure 1. Descriptive statistics of Muse scores.](image1)

![Figure 2. Descriptive statistics of office referrals.](image2)
Discussion

This research contributes to understanding alternative pathways to school discipline besides reliance on office referrals. Though it is impossible to generalize from a study with such a small sample size, the study offers significant insight into a specific strategy—mindfulness training—for providing discipline support to students. This strategy is currently not widely represented in national discourse on student behavior and learning. Data analysis suggests a strong correlation between using Muse headbands for mindfulness training and reducing the number of office referrals for middle-level students. The implications for this phenomenon could be far reaching for students in terms of their socio-emotional and academic growth.

As state departments of education add requirements for schools to meet standards for social and emotional growth, this study sheds light on a viable strategy for students to cope with the demands and stress from inside and outside school. In exit interviews, students used words like “calming” and “relaxing” to describe Muse use. Five students indicated that they could employ mindfulness session techniques during the school day without the use of the Muse. Mindfulness training with the Muse may be able to assist students in coping with negative stress outside of school. In the exit interview, one student indicated, “When I am at home and there is lots of yelling, I can hear the Muse in my mind and calm down.”

The study also suggests that mindfulness training could benefit students academically. Students sent out of their classroom for behavior redirection miss important academic content instruction. This lost instructional time exacerbates dropout rates and achievement gaps. By reducing the amount of time students are absent from the classroom environment for office referrals, exposure to academic content is increased and students are provided with additional opportunities to increase their academic engagement and achievement.

Data analysis of Muse scores indicated participants also were able to grow in their ability to be mindful over time. All students in the treatment group increased their average levels of concentration—the ability to focus inwardly on their breath. The capacity to be mindful and self-regulate has been studied in adults (Goyal et al., 2014), but there is very little research on mindfulness in students. More research is needed into mindfulness training for students and how it might be used (a) as an alternative to office referrals, (b) for students’ self-regulation of negative classroom behaviors, and (c) for helping students cope with negative stress in and out of school.

Limitations

The study’s results must be viewed in light of several limitations. The first limitation to the pilot study is sample size. The limited number of participants influences the generalizability of the results. Future work should replicate the study’s procedures and Muse session protocols with a larger number of participants. A second limitation is the duration of the study. This study lasted for two grading periods (one-half of a semester), and each student participated in 20 mindfulness training sessions. Future research into guided mindfulness training could require daily mindful practices; however, the challenge to any school intervention is the agreement of all stakeholders that the protocol is not an undue interruption of the learning environment. In the current study, this challenge was overcome by utilizing the homeroom period for mindfulness sessions. A third potential limitation is the difficulty of controlling for the variability of conditions present in middle-level schools, and the many complicated and interrelated factors of students’ lives.

Goals for Future Research

To gain a more complete understanding of the impact of mindfulness training on middle-level students, research should explore a larger sample of participants, incorporate more frequent mindfulness training sessions, and offer sessions of varying durations to determine which duration produces the greatest effect. Results of the guided mindfulness training disaggregated by gender and ethnicity might address the alarming trend of overrepresentation of African-American and Hispanic males in office discipline referrals. Additionally, future work could include teacher participation in Muse sessions to measure the effect mindfulness training might have on their perceived stress inside and outside school. Finally, follow-up interviews months and years after the study could reveal lasting effect of mindfulness training on students and teachers.

Conclusion

All students deserve to thrive and learn in an optimal learning environment. However, negative stress can cause students to behave in ways that are detrimental to themselves and others in their learning environment. When students are unable to self-monitor and redirect their behavior, they face negative consequences and are frequently removed from the classroom. The loss of valuable learning time can have...
far-reaching consequences that may impact the trajectory of their lives. This pilot study contributes toward understanding how guided mindfulness training may provide students with a strategy that positively influences their ability to focus and could correlate to fewer office referrals. With both goals in mind, this modest pilot study begins a dialogue that points to the potential of guided mindfulness training for transforming school discipline from a reactive to a proactive approach.

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