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THE RELATIONSHIP BETWEEN MINDFULNESS, ACADEMIC STRESS,
AND ATTENTION

by

Tida Blackburn

A thesis submitted in partial fulfillment
of the requirements for the degree

of

EDUCATIONAL SPECIALIST

in

Psychology

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ABSTRACT

The Relationship Between Mindfulness, Academic Stress, and Attention

by

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Utah State University, 2020

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Some degree of anxiety in learning situations is expected and normal. However, excessive anxiety and stress negatively affect cognitive performance, especially working memory, concentration, and sustained attention. Studies have shown that higher success in academics is related to a better ability to maintain focus on the information presented including auditory and visual attention. College students who are better able to manage stress are more successful than those who cannot. One method of coping with stress and anxiety is the practice of mindfulness (being fully present in the moment; being aware of one's surroundings, mind, and body; and being able to filter out distractions that are stressful in one's life). Mindfulness practice has been found to improve adaptability in stressful situations and improve attention regulation and focus. College students may be vulnerable to distractions, which increase stress and can make it difficult to perform well academically. Mindfulness promotes self-awareness and attention to the present moment, which can reduce stress and anxiety, as well as improve overall psychological well-being.

The current study examined how mindfulness and academic stress associated with auditory, visual, and perceived attention skills in college students. Participants ($N = 62$, average age = 22.6 years, 61.3% female) completed a variety of self-report and standardized performance measures of attention. Results indicated that greater levels of mindfulness were associated with lower levels of academic stress, but did not show strong correlations between mindfulness and attention. The potential effects of mindfulness training on attention and stress for college students are discussed.

(49 pages)

PUBLIC ABSTRACT

The Relationship Between Mindfulness, Academic Stress, and Attention

Tida Blackburn

Some degree of anxiety in learning situations is expected and normal. However, excessive anxiety and stress negatively affect cognitive performance, especially working memory, concentration, and sustained attention. Studies have shown that higher success in academics is related to a better ability to maintain focus on the information presented including auditory and visual attention. College students who are better able to manage stress are more successful than those who cannot. One method of coping with stress and anxiety is the practice of mindfulness. Mindfulness is the ability to be fully present in the moment, be aware of one's mind, body, and surroundings, and the ability to filter out distractions that are stressful in one's life. Mindfulness practice has been found to improve adaptability in stressful situations, attention regulation, and focus. College students may be vulnerable to distractions, which increase stress and can make it difficult to perform well academically. Mindfulness promotes self-awareness and attention to the present moment, which can reduce stress and anxiety, as well as improve overall psychological well-being. The current study examined the associations mindfulness has with academic stress, attention, and perceived attention skills in college students. Sixty-two college students ($M = 22.6$ years, 61.3% female) completed a variety of self-report measures and standardized performance measures of attention. Results indicated that greater levels of mindfulness were associated with lower levels of academic stress, but

did not show a strong relationship between mindfulness and attention. The potential of mindfulness training on attention and stress for college students is discussed.

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CHAPTER I

PROBLEM STATEMENT

Attention is an important factor for college success. Studies have shown that higher success in academics is related to a better ability to maintain focus on the information presented (Steinmayr et al., 2010). College success, including graduation, depends on a student's ability to selectively attend to new, sometimes uninteresting, information (Steinmayr et al., 2010). Research has shown that college students who engaged in attention regulation training activities performed well in academic activities (Steinmayr et al., 2010), while students who struggled with attention regulation had a difficult time meeting academic demands and were more likely to drop out before completion (Struthers et al., 2000).

To pay attention means to be alert but not anxious and to have good visual and auditory focus. Auditory attention allows individuals to rapidly and precisely direct their acoustic searchlight toward sounds of interest in their acoustic environment, which improves their ability to listen and attend. Similarly, visual attention allows individuals to select a certain aspect of a visual scene (selective attention) and grant it priority in processing (Posner & Petersen, 1990). Difficulty attending can lead to increased stress and anxiety when trying to engage in learning activities such as attending in class, homework, studying, and taking exams (Thakur, 2017). Some degree of anxiety in learning situations is expected and normal; however, excessive anxiety negatively affects cognitive performance, especially working memory, concentration, and sustained attention (Fernández-Castillo & Caurcel, 2015). Attention skills are not constant, and the

ability to sustain attention on demand can be difficult in some circumstances.

Previous studies support that stress interferes with attention. Cohen et al. (1997) found that students often experienced a heightened stress response when feeling overwhelmed by the demands of time, grades, exams, homework loads, and work-related constraints. Acute stress can negatively impact health and wellness, as well as become chronic, resulting in more behavior and health problems (American Psychological Association [APA], 2001). Additionally, the stress which students experience in college may affect their academic performance (Weiner, 1990). Given that college students experience academic, social, and financial stress, it is important that they have ways to manage that stress.

The benefits of mindfulness on psychological well-being and the body's response to stress have been well documented (Keng et al., 2011; Melbourne Academic Mindfulness Interest Group [MAMIG], 2006). Mindfulness practice has also been found to improve adaptability in stressful situations and attention regulation (Thomas & Atkinson, 2016). Mindfulness improves one's adaptability to situations encountered in daily life by improving one's ability to focus on the present moment instead of the past or the future (Hayes & Feldman, 2004). Furthermore, mindfulness has been found to mitigate the impact of stress by reducing an individual's propensity to react to emotional stimuli (Keng et al., 2011) and become distracted by environmental stimuli (Hayes & Feldman, 2004). Overall, while stress can decrease school performance, a high level of mindfulness can improve how students handle stress and may improve school performance (Dvořáková et al., 2017; Prakash et al., 2015; Struthers et al., 2000).

The benefits of mindfulness on improving attention regulation have also been well documented (Davis & Hayes, 2011; Rimm-Kaufman et al., 2009; Thomas & Atkinson, 2016). The impacts of stress and the benefits of mindfulness on attention regulation are complex due to the varied cognitive processes which produce attention behaviors (Posner & Petersen, 1990; Schmertz et al., 2009). For example, the cognitive processes of selective and visual attention involve ignoring irrelevant information while prioritizing the relevant (Carrasco, 2011). Mindfulness practice may be beneficial due to promoting stable visual attention and quick recovery of attention when it wanders (Lutz et al., 2008).

The purpose of this study was to examine the following research questions (RQ).

RQ1: Does mindfulness and/or academic stress significantly predict visual attention?

RQ2: Does mindfulness and/or academic stress significantly predict auditory attention?

RQ3: Does mindfulness and/or academic stress significantly predict perceived attention?

CHAPTER II

LITERATURE REVIEW

Attention

Attention regulation refers to a top-down process in which a person attends to a chosen object despite distractions. The act of paying attention is a cognitive process which is dependent upon brain maturation and practice. Attention is a complex and difficult construct to define (Dodge et al., 2012; Schmertz et al., 2009), but is understood as the process of maintaining focus on a specific stimulus to a great degree over a long period (Steinmayr et al., 2010). Attention involves five neuropsychological processes: suppressing attention, sustaining attention, focusing attention, shifting attention, and dividing attention (Thomas & Atkinson, 2016). To selectively attend to a task, an individual must suppress impulsive responses, sustain focus and alertness over time, focus on target information while ignoring surrounding information or stimuli, divide attention between two or more tasks at the same time when necessary, and be able to shift focus flexibly and adaptively. Attention is not the result of a brain structure or area but rather results from input of sensory signals such as visual or auditory stimulation followed by conscious, simultaneous processing in multiple areas of the brain (Pourtois et al., 2013). Both visual and auditory attention play a critical role in one's ability to attend, process, and filter information for learning (Posner & Petersen, 1990). In order to learn, study, and memorize new information, one must use both types of attention, while stress can impair one's ability to do this. In this study, both types of attention were measured in

addition to mindfulness and stress.

Attention Regulation in Academic Success

Attention regulation is important for success in academic settings. Much research has been done to try to identify skills which are important for academic success (York et al., 2015). Attention regulation skills hold a place at the top of that list, as student performance depends upon attending to information and the task at hand (Steinmayr et al., 2010). In school-aged children, those with better attentional control had higher academic performance and showed greater academic improvement over the academic year compared to their same-age peers with lower attentional control (Valiente et al., 2008). Similarly, college students with better control and cognitive shifting ability performed better academically and were more likely to obtain a degree (Marincas & David, 2013).

Measuring Attention Regulation

One way to quantify students' attention is by measuring eye movement through reading, because it requires individuals to shift visual attention while using semantic memory. In one study, Kriebler et al. (2016) examined the relationship between eye movement, reading speed, and comprehension by assessing eye movement in twenty-three German adolescents during reading. The participants read both real and nonsense words in texts in which the page breaks were adjusted according to sentence endings. The reading samples were taken from a standardized inventory designed to measure reading fluency and spelling. The results indicated that more efficient eye movements

significantly correlated with increased reading speed and comprehension. The authors suggested that efficient fluid eye movement was not necessarily associated with age, but instead was the result of practiced sustained attention (Krieber et al., 2016). Even so, attention efficiency generally improves with age due to cognitive maturity, suggesting that age is relevant (Thomas & Atkinson, 2016).

Steinmayr et al. (2010) explored how much a student's success is due to factors other than the student's cognitive potential as measured by general intelligence. They hypothesized that sustained attention moderates the relationship between intelligence and school performance. The study (Steinmayr et al., 2010) assessed possible correlational relationships between intelligence, sustained attention, and school performance among 231 German students in 11th and 12th grade. The study (Steinmayr et al., 2010) supported the hypothesis that the quality of sustained attention accurately predicts school performance, especially regarding numerical intelligence and performance in mathematics. The ability to sustain attention was also found to be a moderator for the relationship between verbal intelligence and academic performance in German class, which is equivalent to English class in American high schools (Steinmayr et al., 2010).

Regarding the role of sustained attention on the relationship between intelligence and school performance, Steinmayr et al. (2010) concluded that different cognitive functions are used for numerical and verbal academic tasks. Although the impact of sustained attention on school performance likely changes depending on task type and difficulty, the study provided evidence that academic performance among nonclinical students improves with attention-regulation training activities (Steinmayr et al., 2010).

These findings are similar to other studies examining the relationship between academic achievement and sustained attention (e.g., Steele et al., 2012).

Stress

What is Stress?

Stress is the state of being overwhelmed by demands from one's environment (Cohen et al., 1997). According to Elkin et al. (1989), The National Institute of Mental Health identifies three types of stressors: (1) routine stress associated with daily pressures (e.g., work, family, responsibilities); (2) stress brought on by non-normative life changes (e.g., divorce, moving, illness); and (3) stress which results from a traumatic event (e.g., major accidents, war, natural disasters). Importantly, the same event may impact people in different ways. Therefore, stress is also defined as any event an individual perceives as requiring more cognitive and emotion regulation (or more mental resources) than are available to him or her at that time.

According to the APA (2016), there are different types of stress: acute stress is short-lived and can be managed and treated easily, while episodic stress occurs when an individual frequently experiences acute stress. The harmful effects of episodic stress can accumulate until there is a negative impact on the individual's health and wellness (APA, 2016). Chronic stress occurs when an individual experiences constant stress over a prolonged period of time and is more closely associated with serious health problems, violence, or suicide as compared to acute or episodic stress (APA, 2016).

According to the American College Health Association (2018), 33.2% of college

students say that stress has a negative impact on their academic performance, 26.5% reported that anxiety has a negative impact on their academic performance, and 87.4% reported that they felt overwhelmed at times in college. In another study with over 400 college students, researchers found that 72.9% suffered from psychological distress, 86.3% suffered from anxiety, and 79.3% exhibited depressive symptoms (Saleh et al., 2017). In addition, the study showed that more than half of the students also suffered from low self-esteem, little optimism, and a low sense of self-efficacy (Saleh et al., 2017). These factors were shown to be the biggest predictors of stress for college students.

Continuous stress can lead to damage to the brain and body including physiological reactions that happen in response to environmental demands such as increased heart rate, respiratory rate, blood pressure, and blood glucose levels. These compensatory reactions occur to ensure that the muscles and vital organs have an ample supply of oxygen, energy, and nutrients to handle the challenging situation (Nathan, 2002). Prolonged stress can also have a negative impact on a person's ability to engage in effective and productive behavior, such as the work that is required to succeed in college (Murff, 2005).

How a person responds to stress can have a negative impact on their behavior and well-being. Self-regulation is how a person handles their emotions in stressful situations. People who have difficulty regulating their emotions often also struggle with attention and focus. Having the ability to self-regulate allows for a well-balanced emotional response to life events, such as maintaining an alert focus without becoming anxious,

which can help to limit the negative effect of stress on academic performance (Kristeller & Wolever, 2010). Mindfulness has been shown to be effective in improving self-regulation and attention in a wide range of populations (e.g., Burg et al., 2012).

Relationship Between Emotion Regulation and Stress

Hayes and Feldman (2004) caution that life events may be positive or negative, but excessive attention via rumination, obsession, worry, and constant focus on stressful events are signs of emotional dysregulation, which is the inability to use healthy strategies to diffuse negative emotions. There is a plethora of studies linking difficulties with emotion regulation to psychopathology, particularly chronic stress, anxiety, and depression (Aldao et al., 2010; Hayes & Feldman, 2004). One particularly long-term study focused specifically on examining the relationship between emotion regulation and chronic stress (Joormann & Gotlib, 2010). The study aimed to identify cognitive processes associated with emotion regulation strategies and their link to depression. Results suggested that individuals with depression had greater difficulty inhibiting their ability to process negative material, which was, in turn, associated with greater rumination. Depressed individuals also had less cognitive control in effectively regulating their emotions and drawing on positive coping strategies such as rationalizing, and they may have been unable to acknowledge the positivity associated with putting forth effort in the present (Joormann & Gotlib, 2010).

Self-regulation and the ability to handle stress is extremely important for success in college. The U.S. Census Bureau (2005) found that in 2003, over 17 million

Americans attended college. As more people attend college in the United States and experience significant stressors, it becomes increasingly important for psychologists to understand the way people deal with stress. Students certainly experience many stressors as they transition from high school to college (D’Zurilla & Sheedy, 1991), and the stresses students experience in college may affect their academic performance. Many of them attribute their successes and failures to their experiences of internal and external stressors (Weiner, 1990). Some frequently experienced stressors include those caused by writing term papers, studying for examinations, and moving from home to a college campus (Murphy & Archer, 1996). For many students, these stressors can lead to a greater risk of illness (Lesko & Summerfield, 1989), poorer academic performance (Struthers et al., 2000), and emotion regulation problems such as heightened anxiety and increased depression (Bouteyre et al., 2007). Attention regulation and emotion regulation skills are essential for achieving academic goals and are also key components of mindfulness.

Mindfulness

Mindfulness is a complex construct that represents nonevaluative, moment-to-moment awareness that originated from the spiritual and religious practices of Eastern meditation over 2,500 years ago (Shonin et al., 2014). Awareness of breath, body tone, and movement are at the center of mindfulness practice (Thomas & Atkinson, 2016) and are physiological indicators of an individual’s state of arousal (Chiesa & Serretti, 2009). In mindfulness practice, individuals are encouraged to reflect upon their body and

immediate sensations with kindness and self-compassion (Davis & Hayes, 2011). In the classic mindful breathing exercise, awareness focuses on the rise and fall of the abdomen, and thoughts should not be critical or distracting (Chiesa & Serretti, 2009). Being mindful enhances nonjudgmental observation and reduces automatic responses (Kabat-Zinn, 2003). Typically, mindfulness practices include breathing, movement, body scanning, and listening exercises while suppressing attention toward judgment, intrusive thoughts, and a wandering mind (Williams & Penman, 2011).

History of Mindfulness

Mindfulness practice originated in ancient Buddhism, and though it was originally integrated with spiritual philosophy, modern mindfulness practice does not necessarily include a spiritual component (Keng et al., 2011). Today, the practice of mindfulness utilizes a collection of methods, techniques, and psychological processes which increase awareness of internal and external stimuli, that in turn tend to influence emotions and lead to maladaptive behavior (Baer, 2003; Bishop et al., 2004). Contemporary mindfulness includes paying attention to the present moment in a non-judgmental way (Kabat-Zinn, 1994). Psychologists agree that the purpose of mindfulness practice is to become more aware of the present moment (Hayes & Feldman, 2004). Hayes and Feldman conceptualize mindfulness as having present-moment awareness by being open and receptive to what is unfolding in the present moment and examining the world with curiosity and acceptance rather than making judgments.

Benefits of Mindfulness

Mindfulness can result in several benefits, and as a result, the practice of mindfulness in the United States has grown steadily since the 1970s (Keng et al., 2011). Broadly, mindfulness interventions have been shown to improve overall psychological functioning, as well as decrease symptoms seen in a variety of physical and psychological problems such as chronic pain, anxiety, depressive relapse, and disordered eating (Baer, 2003). The benefits of practicing mindfulness center around improved self-regulation of emotions, thoughts, and behaviors (Keng et al., 2011). Mindfulness practice increases psychological well-being, which in turn allows individuals to effectively allocate attention to making decisions and pursuing goals (Hayes & Feldman, 2004; MAMIG, 2006). Some benefits of mindfulness include decreasing the body's response to stressors and improving psychological well-being by promoting healthy emotion regulation strategies, such as using adaptive behaviors during stressful situations, applying effective strategies to problem-solving, and employing logical rationalizations during emotional experiences (Hayes & Feldman, 2004; MAMIG, 2006).

Mindfulness, Stress, and Attention in Academics

Attention regulation, like emotion regulation, is a key component of mindfulness practice as it involves active attention, which leads to awareness (Schmertz et al., 2009). However, the influence of mindfulness on sustaining attention is complex. Schmertz et al. (2009) discovered that mindfulness might not directly relate to focused attention ability, but rather to how students rate their attention to present experiences, especially regarding

lapses in attention. Additionally, they did not find a strong relationship between self-reported mindfulness and students' attention-shifting and selective attention abilities (Schmertz et al., 2009).

This lack of a strong relationship raises the question of whether student mindfulness is related more to measured attention or more to how one feels about their level of academic attention at the moment. It also raises concerns about how students' mindfulness and academic attention are measured. Attention regulation involves several cognitive processes such as working memory and sensory systems; therefore, it is difficult to isolate as an executive function (Schmertz et al., 2009). Schmertz et al. recommended that future studies explore the relationship beyond self-reporting and measure attention in response to mindfulness practice.

One factor that reduces attention regulation ability is stress. One hypothesis as to why this occurs is that emotional individuals tend to overload their attention system by depleting the attention resources available to them on information less relevant to the task at hand (Easterbrook, 1959). Booth and Sharma (2009) found that inducing acute stress with loud white noise resulted in participants performing poorly on a Stroop interference task indicating a reduced attention to irrelevant information. Furthermore, the neural-generated stress response impairs an individual's ability to effectively execute the cognitive attention processes, which may interfere with memory and learning performance (Flaks et al., 2014).

Mindfulness in Action

One way to increase attention regulation is by focusing attention continuously on

a chosen stimulus, such as the breath or a physical object, and returning attention to the object when it is inadvertently shifted away by other stimuli. With practice, attention becomes more stable, which improves executive control (Lutz et al., 2008). Some activities, however, require little attention and are automatic (i.e., done out of habit with little mental energy) such as walking, riding a bicycle, and driving a car. Attention can also require controlled effort, drawing on mental reserves when the selective focus is required. For example, active listening, critical thinking, and learning and performing novel tasks demand effort to minimize distraction from external and internal stimuli such as wandering thoughts and sensory stimulation (Fabio, 2009).

Paws b Mindfulness Program

Research on the effects of mindfulness practice among students is growing. Thomas and Atkinson (2016) conducted a quasi-experimental design study to evaluate the impact of a mindfulness program among students aged eight and nine in the primary school setting. The students were assigned to an experimental group, or a waitlist control group. The Paws b school-based mindfulness program consisted of six 1-hour lessons given weekly covering a series of topics beginning with an introduction to the brain, making choices, and breath counting. The lessons were delivered as slideshow presentations on topics related to feelings, worries, reactions, and the philosophy of mindfulness (Thomas & Atkinson, 2016). The participants were administered the inhibition subtest of the Developmental Neuropsychological Assessment Second Edition [NEPSY-II], for children aged 3–16 years (Korkman et al., 2007), and the teachers completed the attention checklist for each participant (Thomas & Atkinson, 2016).

The teacher-reported attention checklist scores between the two groups did not differ significantly at the start of the intervention (Thomas & Atkinson, 2016). The findings after the intervention, however, suggested that children who underwent the Paws b intervention increased their attention (as demonstrated by an increase in the attention checklist score), but those in the control group did not (Thomas & Atkinson, 2016). There were also significant improvements in the scores of the experimental group on the NEPSY-II inhibition subtest (naming and inhibitory total errors), and similar increases for the inhibitory total errors were found between the two groups (Thomas & Atkinson, 2016). Thomas and Atkinson noted that the positive effects of the intervention were still observable at the follow-up assessment, suggesting that students may have continued to practice mindfulness outside of the school setting in their daily lives. Overall, the results of this study done by Thomas and Atkinson support the hypothesis that a positive relationship exists between mindfulness and attention among students.

Mindfulness in Clinical Populations with Attention-Deficit Hyperactivity Disorder

Several studies have shown that mindfulness effectively mitigates attention problems in clinical populations such as children diagnosed with attention-deficit hyperactivity disorder (ADHD). According to the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-5*; American Psychiatric Association, 2013), ADHD is marked by pervasive patterns of inattention, hyperactivity, impulsivity, or a combined subtype encompassing both a deficit in attention and hyperactivity which interferes with a person's functioning or development. Campbell et al. (2012) designed a study to measure

the effectiveness of an 8-week mindfulness training program for adolescents aged 11 to 15 with ADHD along with parallel mindful parenting training for their parents. This study used multi-modal methods including questionnaires and computerized attention tests to evaluate the impact of mindfulness directly after training (Campbell et al., 2012). The results suggested that on self-report measures, adolescents' attention problems decreased and executive functioning improved; enhanced performance on the computerized attention test confirmed improvements (Campbell et al., 2012). Mindfulness may therefore help improve attention and performance in learning situations.

Implications of Stress, Attention, and Mindfulness for College Students

College students are young adults with increasing responsibilities. Some students may be underprepared to manage new attention challenges and some may already have predispositions toward poor attention regulation, such as individuals who have an existing neurodevelopmental challenge such as ADHD, depression, or anxiety (Hunt & Eisenberg, 2010). Some degree of anxiety is expected in learning situations; however, excessive anxiety negatively affects cognitive performance—especially concentration, working memory, and sustained attention (Fernández-Castillo & Caurcel, 2015). Performance stress can trigger associated anxiety, often in the form of test anxiety, when an individual experiences fear of failure or negative assessment before, during, or after an exam (Fernández-Castillo & Caurcel, 2015). Higher education institutions often offer

wellness services and resources to help students manage and treat stress and other psychological conditions which may interfere with academic success. However, college students may underutilize these resources. College students with mental health disorders such as depression or anxiety are particularly vulnerable to problems with self-regulation, which can negatively impact their ability to attend and learn.

Hunt and Eisenberg (2010) explored the prevalence of mental health disorders among college students, risk factors associated with mental health disorders for college students, and the extent to which college students receive treatment for mental health disorders. They pooled data from multiple studies conducted between 2006 and 2007, which included more than 26,000 students attending more than 100 colleges and universities (Hunt & Eisenberg, 2010). Their findings revealed that over 33% of college students reported feeling depressed to the point of not being able to function, and 10% reported seriously considering suicide at least once during the previous year (Hunt & Eisenberg, 2010). Additionally, 10% of students met the criteria for an anxiety disorder (Hunt & Eisenberg, 2010). Despite the high prevalence rates of anxiety and mood concerns, Hunt and Eisenberg showed that as few as 20–24% of students diagnosed with a psychological disorder received some form of treatment. They also found that campus health and psychological services often fail to identify these students as good candidates for early intervention (Hunt & Eisenberg, 2010).

Hunt and Eisenberg (2010) found that risk factors for depression and anxiety in college include relationship stressors, a lack of social support, low socioeconomic status (SES), and being female (for anxiety disorders) or male (for suicidal behaviors). They

additionally noted that barriers to seeking treatment among college students were low SES, concerns about privacy, a lack of emotional openness, and attitudes toward the disorder and treatment thereof (Hunt & Eisenberg, 2010). A high level of stress in college students can lead to deficits in attention as evidenced above, impacting academic functioning (Hunt & Eisenberg, 2010). However, there have been limited studies to date in this area.

One effective tool for decreasing stress and improving self-regulation and attention is the practice of mindfulness. In fact, simply learning about mindfulness and its applications from a low-intensity mindfulness course led to improvements in college students' nonjudgmental and non-reactive stance toward their thoughts, feelings, and emotions (de Bruin et al., 2015). Similarly, college students who took a 7-week mindfulness course demonstrated improved attention and reported being more "on task" compared to a control group (Morrison et al., 2014). In another study, 81% of college students reported positive effects of mindful awareness practices such as reducing tension in the body, focusing on the task at hand, and feeling more in control (Yamada & Victor, 2012). Studies support that learning mindfulness skills in college can improve attention as well as decrease stress. For example, in a study done at the University of Minnesota, college students assigned to the mindfulness meditation group showed significant improvement on attention tests when compared to students who did not learn the mindfulness meditation technique (Strickland & Selwyn, 2019). Importantly, college students appear to embrace the notion of mindfulness and believe that it helps them focus, manage stress, and deal with relationships more effectively (Bamber & Schneider,

2016).

Mindfulness practices could be a plausible solution for college students looking to improve their cognitive performance on tasks for work, school, and life. Some research supports that not only can mindfulness affect attention, but that a person's existing attention skills may also affect their ability to practice mindfulness and manage stress (e.g., Greif & Kaufman, 2019). Attentional control, the ability to manage one's attentional focus, may be related to a person's ability to learn mindfulness or learn to self-regulate and navigate stressful or anxiety-provoking situations (Macdonald & Olsen, 1994). While it remains unclear whether or not mindfulness improves attention or if existing attention skills affect the ability to use mindfulness, research does seem to support that there is a relationship between the two.

CHAPTER III

THE CURRENT STUDY

College students may be vulnerable to distractions, which increase stress and can make it difficult to perform well academically. Mindfulness promotes self-awareness and attention to the present moment, which can reduce stress and anxiety, as well as improve overall psychological well-being. While research substantiates the benefits of mindfulness, further study is needed to better understand the relationship between mindfulness practice and attention performance among college students. This study addressed the following research questions derived from the review of existing literature in the areas of mindfulness, academic stress, and attention.

- RQ1: Does mindfulness and/or academic stress significantly predict observed visual attention? It is hypothesized that academic stress will negatively impact visual attention and students with higher mindfulness will demonstrate better visual attention.
- RQ2: Does mindfulness and/or academic stress significantly predict observed auditory attention? It is hypothesized that academic stress will negatively impact auditory attention and students with higher mindfulness will demonstrate better auditory attention.
- RQ3: Does mindfulness and/or academic stress significantly predict perceived attention? It is hypothesized that academic stress will negatively impact perceived attention and students with higher mindfulness will report better perceived attention.

CHAPTER IV

MATERIALS AND METHODS

Participants

The participants in this study were 62 college students attending a mid-western college in the U.S. The participants' mean age was 22.6 years ($SD = 5.8$; range = 18-45). Among the participants, 61.3% were female, 91.9% were Caucasian, 1.7% were Hispanic, and 1.7% were either Middle Eastern or Native American. Participants' average GPA was 3.42 ($SD = 0.4$; range = 4.3-2.2). Participants were recruited on campus by publicly posted fliers and through SONA. All participants were required to speak English as their first language and not have vision or hearing issues that would prevent them from performing the required assessments. The participants were a subset of those from a larger research study investigating the effects of an app-based mindfulness intervention on attention and academic stress in college students. Power analyses indicated that a minimum of 60 participants were needed for a medium effect size when the one-tailed test was set at $p < .05$ with a power of .80.

Materials

Conners Adult ADHD Rating Scales – Self-Report Short Version [CAARS-S:S]

The Conners Adult ADHD Rating Scales—Self-Report Short Version (CAARS-S:S) is a self-report rating scale that measures the presence and severity of ADHD symptoms in adults and was used in this study to measure participants' perceived

attention skills (Conners et al., 1999). The CAARS-S:S consists of 26 items and results in five subscales, though this study specifically used the inattention subscale. Participants read and responded to items on the following Likert scale: *1 = None of the Time, 2 = A Little of the Time, 3 = Some of the Time, 4 = Most of the Time, and 5 = All of the Time.* The CAARS-S:S is administered online and takes 10–15 minutes to complete.. This study interpreted the CAARS-S:S using *t* scores, wherein 45-55 is average, 56-60 is slightly above average, 61-65 is above average, 66-70 is much above average, and 70+ is very much above average. The internal consistency reliability for attention or memory problems subscale for men, depending on age, ranges from .79 to .83, while the internal consistency reliability for women, depending on age, ranges from .80 to .90 (Conners et al., 1999).

Conners Continuous Auditory Test of Attention

The Conners Continuous Auditory Test of Attention (CATA) assesses inattentiveness, impulsivity, sustained attention, auditory laterality, and auditory mobility in individuals ages eight and older (Conners, 2014). The CATA was used to measure overall auditory attention. The CATA is a 14-minute computer administered task in which participants listen to both high- and low-tone sounds and are asked to only respond to the high-tone sounds when preceded by a low-tone sound. Results for this study are interpreted using the following *t*-scores: 70+ is very elevated, 60-69 is elevated, 55-59 is high average, and 45-54 is average.

Overall for the CATA, measures of internal consistency using the median split-half reliability method showed values ranging from .97 to .98, thus indicating good

internal reliability. Test-retest reliability medians ranged from $r = .60$ to $r = .64$ with the normative sample. The CATA shows good discriminative validity and can discriminate between individuals with ADHD and the general population (Conners, 2014). While the CATA manual does not indicate differentiation between clinical disorders, participants who have many atypical scores have a high clinical likelihood of having ADHD. This study measured attention levels by using scores of omissions or missed targets on the CATA. High omission error rates on the CATA indicate that the participant was not responding to the target due to inattention.

Conners Continuous Performance Test, 3rd Edition

The Conners Continuous Performance Test, 3rd Edition (CPT-3) assesses attention-related problems, impulsivity, sustained attention, and focus in individuals ages eight and older via computer (Conners, 2014). The CPT-3 was used in this study to measure visual attention. The CPT-3 takes 14 minutes to complete and is a computer-administered test wherein participants are asked to press the spacebar when any letter except “X” appears on the screen. The t scores are interpreted using the same scale as the CATA (as described in the previous section).

Discriminative validity and incremental validity analyses indicated that the CPT-3 accurately differentiates between groups with clinical ADHD and the general population. Generalizability analyses showed that scores were generalizable across race and that there was no difference in scores using a different desk or mouse. Results from reliability analyses revealed that there were high levels of internal consistency and that scores were

stable across administrations, supported by the median split-half reliability estimate, r ranging from .92 to .93 (Conners, 2014). Test-retest reliability had a median of $r = .67$. Reliability showed internal consistency and resulted in similar results to the CATA. Attention levels and scores were measured in the same fashion as the CATA (using t scores).

Lakaev Academic Stress Situation and Response Scale

The Lakaev Academic Stress Situation and Response Scale (LASRS) is a self-report measure which assesses the frequency of physiological, behavioral, cognitive, and emotional stress responses to school situations which generate anxiety (Lakaev, 2009). The LASRS was used in the present study to measure stress levels. Respondents rated how often they experienced identified symptoms on the following 5-point Likert scale: *1 = None of the Time, 2 = A Little of the Time, 3 = Some of the Time, 4 = Most of the Time, and 5 = All of the Time*. Greater total and sub-scale scores indicated a more severe stress response.

When administered to college students, the internal consistency alphas of the total and subscale scores of the LASRS were above .80, suggesting that the test measured its identified constructs well (Lakaev, 2009). Correlation coefficients between the LASRS and other stress scales showed moderate convergent validity from .61 to .74 (Lakaev, 2009). The LASRS uses the following anchors: *None of the Time (1), A Little of the Time (2), Some of the Time (3), Most of the Time (4), and All of the Time (5)*. Items are summed for subscale scores and subscales are summed for a total LASRS stress response

score. Higher scores indicate a greater stress response. Items for the LASRS were generated from a review of the general stress and academic stress literature.

Twenty-seven items were selected and then tested in a pilot study, and 45 student volunteers completed the 27 items as well as the Kessler-10, a measure of non-specific psychological distress. The 27 items were then submitted to a principal components analysis, which confirmed the 4-factor component structure of the questionnaire. Reliability analysis of the four factors using the leave-one-out procedure suggested that the scales would be improved by discarding six items. The remaining 21 items yielded acceptable to excellent internal consistency ranging from .63 to .92. These 21 items became the LASRS as used in the present study to measure student responses to academic stress (Lakaev, 2009) and total raw scores were used in the analyses.

Mindful Attention Awareness Scale

The Mindful Attention Awareness Scale (MAAS) is a trait measure that uses a 15-item self-report scale which measures attention and awareness across several domains of experience such as cognitive, emotional, and physical (Brown & Ryan, 2003). This study used the MAAS to measure perceived mindfulness by having participants read items and rate them using the following 6-point Likert scale: *1 = Almost Always, 2 = Very Frequently, 3 = Somewhat Frequently, 4 = Somewhat Infrequently, 5 = Very Infrequently, and 6 = Almost Never*. Higher scores indicated higher levels of perceived mindfulness.

The MAAS has internal consistency levels (Cronbach's alpha) ranging from .80 to .90, and it has good test-retest reliability ($r = .81$). The MAAS positively correlates

with the number of years practicing meditation ($r = .36, p < .05$), which is a technique aimed at increasing mindfulness (Brown & Ryan, 2003). Cronbach's alpha indicated good internal reliability ($\alpha = .89$), and the mean performance was at 60% of scale maximum ($M = 4.00, SD = 0.85$). Confirmatory factor analysis revealed that the single factor structure provided an adequate fit to the data: $RMR=0.082, CFI=0.914, RMSEA=0.071, CI= 0.065-0.079$ (Brown & Ryan, 2003). Total raw scores were used for the purposes of this study.

Procedures

The present study received Utah State University IRB approval and was part of a larger intervention study examining the effects of mindfulness on academic stress and executive functioning in college students. Participants were recruited through the university's SONA credit program and publicly posted fliers, and they earned either money or credit in the SONA class credit program for their participation. In the larger study, participants completed two in-clinic visits. However, in this study, analyses only included the data collected during the first clinic visit.

During the first clinic visit, participants completed a Qualtrics online survey that included a demographic questionnaire and several self-report measures, including the MAAS and the LASRS. Participants then completed the CAARS-S:S, CPT-3, and CATA. The testing site was a clinic in the education building, and a researcher was in the room with each participant. The room consisted of a table and chairs. The participants completed all of the tests and questionnaires on a standard laptop computer.

Design and Data Analysis

This study sought to better understand attention and the directional impact of how mindfulness and academic stress influence types of attention. Three linear regression analyses were used to determine the relationship between mindfulness, perceived attention, and visual and auditory attention, as well as the relationship between academic stress, perceived attention, and visual and auditory attention. Perceived mindfulness and academic stress served as the independent variables, which were measured by the MAAS and LASRS respectively. The dependent variables were perceived attention, observed visual attention, and observed auditory attention, which were respectively measured using the CAARS-S:S inattention subscale, the CPT-3 score of omissions (i.e. missed targets), and the CATA score of omissions *t* scores. The score of omissions were chosen because they indicated that the participant was not responding to target stimuli indicating inattention, and the inattention subscale for the CAARS-S:S was used because the focus was on measuring inattention.

CHAPTER V

RESULTS

Using Jamovi version 8.60 descriptive statistics were calculated including means and standard deviation for all measures. The relationship between the dependent variables perceived attention and actual attention (visual attention and auditory attention), and the independent variables mindfulness and academic stress were explored in this study. The descriptive statistics for all five variables are shown in Table 1.

Table 1

Descriptive Statistics of Outcome and Predictor Variables

Measure	<i>N</i>	Mean	<i>SD</i>	Median	Minimum	Maximum
Outcomes						
CPT-3	60	47.8	6.8	46.0	43.0	90.0
CATA	60	48.0	7.4	45.0	45.0	86.0
CAARS	60	57.0	9.2	55.0	40.0	75.0
Predictors						
MAAS	62	52.0	10.7	52.0	31.0	75.0
LASSR	62	50.5	9.8	50.0	25.0	81.0

Note. All scores are reported as *t* scores. All who did both mindfulness and academic stress tests did at least one of the three attention tests. For example, one person completed the mindfulness and academic stress and the visual and auditory attention tests but did not complete the perceived attention test. Another did not complete the visual attention test but did complete the auditory and perceived attention tests.

Table 2 shows intercorrelations among the three attention measures, mindfulness, and academic stress. Among the dependent variables, perceived attention and observed visual attention were significantly and positively related as measured by the CAARS-S:S, CPT-3, and CATA. Observed visual attention and observed auditory attention were significantly and moderately related ($r = .77, p < .01$) as measured by the CPT-3 and CATA. There was low correlation between perceived attention and observed auditory

attention as measured by the CAARS-S:S and the CATA ($r = .30, p < .01$). The relationship was not statistically significant. All of the intercorrelations between the dependent variables and the independent variables were nonsignificant.

Table 2

Intercorrelations Among Measures of Attention, Mindfulness, and Academic Stress

Variables	CPT3	CATA	CAARS	MAAS	LASRS
CPT-3	N/A				
CATA	0.77**	N/A			
CAARs	0.13	0.30*	N/A		
MAAS	0.06	0.16	0.01	N/A	
LASRS	-0.01	-0.07	0.18	-0.45**	N/A

* $p < .05$.

** $p < .01$.

Multiple regression analyses using each of the three dependent variables (auditory attention, visual attention, and perceived attention) were run to address the three research questions. The results of each of these analyses are provided in Table 3. For Research Question 1, “Does mindfulness and/or academic stress significantly predict observed visual attention?”, results indicated that the model was not significant ($R^2 < .01, F [2, 57] = 0.12, p = .89$). Similarly, for Research Question 2, “Does mindfulness and/or academic stress significantly predict observed auditory attention?”, mindfulness and academic stress did not explain a significant portion of the variance in CATA omission scores ($R^2 = .03, F [2, 57] = 0.76, p = .47$). Finally, for Research Question 3, “Does mindfulness and/or academic stress significantly predict perceived attention?”, mindfulness and academic stress did not explain a significant portion of the variance in CAARS-S:S inattention scores ($R^2 = .20, F (2, 57) = 1.20, p = .31$).

Table 3

Regression Analysis of CPT-3, CATA, and CAARS-S:S by Mindfulness and Academic Stress

Model/variable	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	<i>R</i> ²
CPT-3					
Intercept	45.69	7.50	6.09	< 0.01	0.00
MAAS	0.04	0.09	0.44	0.66	
LASRS	0.00	0.08	-0.01	1.00	
CATA					
Intercept	42.84	8.12	5.27	< 0.01	0.03
MAAS	0.16	0.10	1.07	0.29	
LASRS	-0.01	0.09	-0.10	0.92	
CAARS					
Intercept	44.09	10.05	4.39	< 0.01	0.04
MAAS	0.09	0.12	0.73	0.47	
LASRS	0.16	0.11	1.55	0.13	

Note. CPT-3 Omissions = Conners Continuous Performance Test, 3rd Edition; CATA Omissions = Conners Continuous Auditory Test of Attention; CAARS-S:S Inattention = Conners Adult ADHD Rating Scales—self-report short version; MAAS = Mindful Attention Awareness Scale; LASRS = Lakaev Academic Stress Situation and Response Scale

There was a high correlation between CPT3 and CATA scores as seen in the Pearson correlation coefficient ($r = .77$), indicating a distinct relationship. This relationship was significant ($p < .01$). There was low correlation between CAARS-S:S and CATA scores as seen in the Pearson correlation coefficient ($r = .30$), indicating a small relationship. This relationship was significant ($p < .05$). There was moderate correlation between academic stress and mindfulness as seen in the Pearson correlation coefficient ($r = -.45$), indicating a substantial relationship. This relationship was significant ($p < .01$). The remaining correlations were not significant.

CHAPTER VI

DISCUSSION

The current study examined the extent to which mindfulness and academic stress significantly predicted attention-based outcomes. Specifically, it tested whether mindfulness and/or academic stress significantly predicted visual attention, auditory attention, and/or perceived attention. The findings showed that neither academic stress nor mindfulness accounted for a significant amount of the variance in any of the three attention variables. While existing studies have supported the benefits of mindfulness practice on attention (Thomas & Atkinson, 2016), the findings from this study do not support this relationship

Regarding the relationship between visual attention and mindfulness (RQ1), the results showed no significant relationship between participants' omissions on the CPT-3 and mindfulness scores on the MAAS. Likewise, regarding the relationship between mindfulness and observed auditory attention (RQ2), there was no significant relationship between the number of CATA omission errors and mindfulness scores on the MAAS. Lastly, regarding the relationship between perceived attention and mindfulness (RQ3), there was no significant relationship between self-reported scores on the CAARS-S:S and mindfulness scores on the MAAS.

Previous research by Schmertz et al. (2009) had suggested that weak correlation between attention and mindfulness may be related to limitations of relying only on self-reporting measures. The present study employed a mix of observed and self-reported data collection methods but did not find sufficient evidence to support predictive relationships

between mindfulness and attention behaviors. While this study did not measure the relationship between mindfulness and academic success, it did find support for a relationship between higher mindfulness practice and lower academic stress. While studies looking at the effect of mindfulness practice on attention behaviors in elementary school aged children, such as those done by Campbell et al. (2012) and Thomas and Atkinson (2016), found that children who practiced mindfulness had higher scores on attention measures, the present study did not find significant evidence for mindfulness on visual, auditory, or perceived attention among college participants. A study by de Bruin et al. (2015) found that mindfulness awareness was associated with positive thoughts, feelings, and emotions among college students, and the present study further found that with higher mindfulness, the participants had lower academic stress.

Although self-reporting has limitations to measure attention and mindfulness (Schmertz et al., 2009), this study used a mix of observed and self-report data collection methods. In future research, less biased and more objective measures of attention and mindfulness should be used. For example, one study looked at a psycho physiological measure of mindfulness that used a psychophysiological method for assessing mindfulness learned through time-limited therapy with people doing meditation for the first time (Bostanov et al., 2018). They used individual pre-post-therapy changes (dERP_i) in the event-related brain potentials (ERPs) recorded in a passive meditation task as a measure of increased mindfulness. dERP_i is computed through multivariate assessment of individual participant's ERPs.

Future research examining mindfulness and stress should look more closely at the

relationship between emotional states and the ability to sustain attention in novel situations such as learning new information or academic success in college. Future studies should also look at different ways to measure mindfulness, stress, and attention in college students. For example, the Wheel of Awareness (Shapiro et al., 2018) provides a more in-depth assessment of mindfulness using a guided meditation practice that may give a better indication of awareness and focus in the moment, and The Philadelphia Mindfulness Scale (Cardaciotto et al., 2008) measures mindfulness in the moment and may be helpful to use prior to a stress or attention measure to see if the person's state of mindfulness has any impact on their stress or attention.

A limitation in this study was that some selected measures (e.g., CAARS-S:S) are often used in populations which are suspected of having significant attention problems, such as those seen in ADHD. One alternative for future research is to look at the relationships between mindfulness, stress, and attention and students' test scores, grades, or GPA. Future studies may also look at how students' perception of their attention skills and stress might be improved through mindfulness training and intervention.

A final limitation of this study was that it focused on academic stress and not on other types of stress. While performance stress is an important hindrance to success in college, it is possible that the relationship is indirect (Brown & Ryan, 2003) and that other sources of stress trigger fear of poor performance or academic stress (Beiter et al., 2015). Future studies should consider assessing additional variables (i.e., depression, anxiety, and general stress levels, as well as self-efficacy and perceived support) to better understand the connection between levels of mindfulness and college success.

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