

MINDFULNESS MEDIATES NEUROTICISM AS A PREDICTOR OF SELF-CONTROL
AND IMPULSIVITY: POTENTIAL IMPLICATIONS FOR BEHAVIORAL REGULATION

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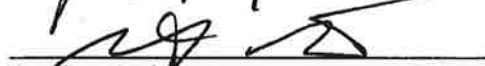
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ABSTRACT

Mindfulness, a concept described as an open and detached but engaged manner of relating to internal and external stimuli (Brown, Ryan & Creswell, 2007) has been found in previous research to fully mediate the neuroticism-impulsivity and neuroticism-self-control relationships (Fetterman, Robinson, Ode, & Gordon, 2010). The current study replicated Fetterman et al.'s study to evaluate mindfulness as a mediator of the neuroticism-impulsivity and neuroticism-self-control relationships in a new sample ($n = 287$). A multiple regression was run in which neuroticism and mindfulness were evaluated as simultaneous predictors of impulsivity (Baron & Kenny, 1986). In this multiple regression, mindfulness remained a significant predictor of impulsivity, ($Beta = -.443, p < .001$), but neuroticism was no longer a significant predictor, ($Beta = .099, p = .107$). In addition, neuroticism and mindfulness were simultaneously evaluated as predictors of self-control. The results here partly diverge from previous findings in Fetterman et al.'s research. In both the previous research and the current findings, mindfulness remained a significant predictor, ($Beta = .394, p < .001$); however unlike in the previous research, neuroticism also remained a significant predictor, ($Beta = -.293, p < .001$), but to a lesser degree than when mindfulness was not evaluated as a predictor, suggesting that in the current sample mindfulness partially rather than fully mediates the relationship between neuroticism and self-control. These results, though slightly distinct from previous findings, could point to the usefulness of mindfulness for addressing behavioral dysregulation correlates to neuroticism. Future research should explore the subtleties of mindfulness as a mediator in these relationships,

in particular the neuroticism-self-control relationship, and practical uses for mindfulness to potentially address behavioral dysregulation and enhance self-regulation.

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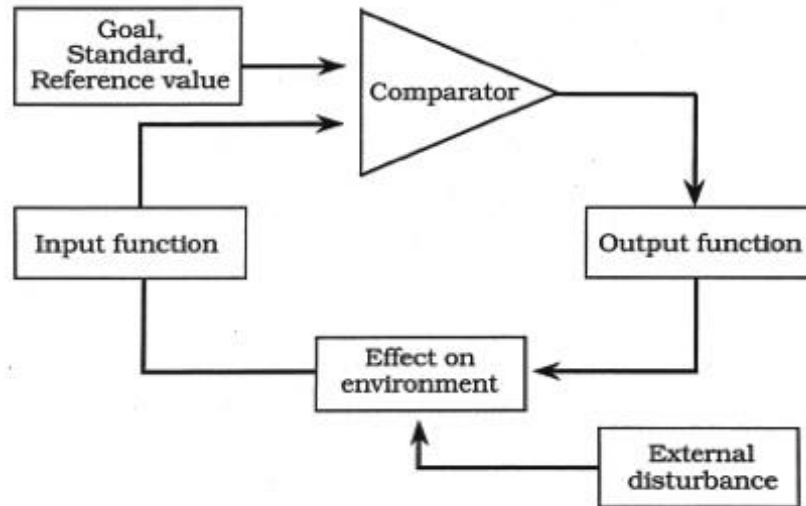
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CHAPTER 1: INTRODUCTION

Neuroticism (a predisposition to negative affect) is often associated with behavioral dysregulation (i.e. depression, anxiety, occupational impairment, and overall lower functioning based on Global Assessment of Functioning score) (Miller & Pilkonis, 2006). Recent research conducted by Fetterman et al. (2010) assessed mindfulness as a useful tool for exploring associations between neuroticism and two indicators of behavioral dysregulation: self-control and impulsivity. Fetterman et al. hypothesized in their research that relations between neuroticism and behavioral dysregulation would be mediated by individual differences in mindfulness, which is an engaged yet non-judgmental manner of relating to the present moment, and proposed that over-responsiveness to negative affect leads to behavioral dysregulation.

As Fetterman described, one theory that can be useful for understanding the associations between neuroticism and behavioral dysregulation is cybernetics theory (also referred to as “control theory”) (Carver & Scheier, 1982; Carver, 2004). Cybernetics theory describes behavior in terms of individual control over regulating the self to move toward and away from goals. The process of regulating the self for goal pursuit is managed by a feedback loop. This loop consists of the 1) the goal, which serves as the standard or reference value 2) the comparator, a mechanism that compares the input (perceptions) to the reference value, 3) the output function (internal or external behavior) 4) the behavior’s effect on environment, if any, and 5) the resulting input (perception), which is then looped back to comparator to assess progress towards goals.

1: Cybernetics Theory Feedback Loop (Carver, 2004)



The above figure demonstrates this self-regulation process (Carver, 2004). The individual's affect serves as an important component of this process. In the loop described, the input (perception) leads to a given affect, but only when said input (perception) is compared to the goal. Each stage of the process receives input from the preceding stage, processes it in some way, and feeds an output to the subsequent stage of the process. If the individual compares between their perceptions and goals and determines there is a discrepancy, cybernetics theory suggests that the individual's output function (behavior) will change in an attempt to correct the discrepancy. Central to this process is the notion that behavior is motivated by the difference between how things are (one's perceived environment) and how one would like things to be (one's goals). Thus, affect and behavior are tightly bound in an individual who is reactive to perceptions and goal strivings. As Carver (2004) explained, "A person with very reactive emotions is prone to overreact and to oscillate behaviorally." Such individuals will have more reactive and impulsive behaviors as they strive to unite perceptions with goals. At the heart of this reactivity is the idea that a discovered discrepancy will produce negative affect; in an attempt to quickly reduce negative affect (short-term goal) behaviors may be reactively

implemented which may or may not be helpful to long-term goals for the self. Optimal self-regulation is a continuous process of balancing behaviors to meet the needs of short- and long-term goals. Given that neuroticism is linked with behavioral dysregulation in this feedback process, it was determined that exploring neuroticism's associations with reactivity in the forms of impulsivity and self-control would be useful, and that mindfulness, which fosters non-reactivity and reflective responding, may successfully short-circuit neuroticism's affective influence on impulsivity and self-control.

A theoretical predecessor (Gray, 1982) that influenced Carver's cybernetics theory proposed that one's personality dictates a tendency to rely on the behavioral activation system (BAS) or the Behavioral Inhibition System (BIS) to determine behavior (Carver & White, 1994). According to Gray, individuals motivated by the BAS tend experience more positive affect and also tend to preferentially respond to approach/reward cues, while individuals motivated by the BIS experience more negative affect and tend to preferentially respond to avoidance/punishment cues. Neuroticism predisposes the individual to elevated use of the BIS, which can result in excessive reactivity to negative stimuli that is detrimental to self-regulation and also inhibits movement toward goals (Elliot & Thrash, 2002). A third system within this model, the Nonspecific Arousal System (NAS) amplifies the effects of activation of the BIS and BAS. Neuroticism is associated with higher NAS sensitivity, fostering "hypervigilance" of cues from both the BIS and BAS.

The implications of elevated neuroticism within these models include automatic orienting of attention as well as blunted evaluation and correction of problematic thoughts and behaviors. Preoccupation with and reactivity to negative cues distracts from focus on immediate behavior and is associated with negative affect and psychopathology. A recent study found that there are

positive correlations between neuroticism and risk for general cognitive failure, which reinforces the theory that elevated negative affect can interfere with optimal executive control (Flehmig, Steinborn, Langner, & Westhoff, 2007). Flehmig et al. proposed that individuals high in neuroticism are predisposed to committing cognitive failures due to intrusions of task-irrelevant cognitions, and that these cognitive failures may be responsible for lapses in attention and dysregulated behavior. Other research has suggested that responding to negative feedback can be functional for self-regulation, but that excessive sensitivity to avoidance/punishment as found in neuroticism can dysregulate one's responses to negative feedback and undermine self-regulation (Robinson, Moeller, & Fetterman, 2010).

Another relevant theoretical predecessor involves the supervisory attentional system, first described in a proposed framework of attentional control of executive functioning by Norman and Shallice (1986). The supervisory attentional system uses controlled attention to override scripted behaviors that are based on automatic schemas and requires increased attention and processing for decision-making. According to this framework, willed and automatic actions are controlled at different levels depending on the degree of task difficulty and complexity. When the action involves a well-learned or automatic response, the control operates at a lower level to produce a desired response. When the action/response is novel or complex, the supervisory system is required for selection of a desired response sequence. For certain behaviors, such as walking or taking a shower, effortful processing may not be needed. However, for the purpose of addressing any harmful behavior that may result from automatic scripts, use of the supervisory attentional system increases attention and fosters self-awareness. Mindfulness fosters attention and self-awareness aspects of executive function, and may be a useful tool for optimal self-regulation (Holas & Jankowski, 2012).

The research presented here examines mindfulness as a means of potentially targeting neuroticism as a determinant of self-regulation, specifically in terms of underregulation of behavior (caused in part by poor monitoring) and dysregulation of behavior (especially as caused by unwanted emphasis on emotion and failure to transcend emotion) (Baumeister & Heatherton, 1996). The results of three studies by Fetterman et al. (2010) cumulatively suggested that a) neuroticism was an inverse predictor of mindfulness; b) higher levels of mindfulness were associated with lower levels of impulsivity; and c) higher levels of mindfulness were associated with higher levels of self-control. These results provide evidence that over-responsiveness to negative affect leads to behavioral dysregulation, but when mindfulness is present the behavioral dysregulation correlates of negative affect no longer take hold. In addition, Fetterman et al. found that mindfulness mediated between neuroticism and self-control and impulsivity outcomes, such that when mindfulness was present neuroticism no longer significantly predicted impulsivity and self-control. Fetterman et al. proposed a cognitive-mediational model in which individuals high in neuroticism are less capable of identifying and overriding problematic behaviors, but that when mindfulness is present the deleterious effects of neuroticism on impulsivity and self-control no longer take hold. This has important clinical implications for any number of behaviors in healthy as well as clinically diagnosed individuals and warrants further study, including replication by other researchers with different subjects. According to Baumeister and Vohs (2004), “Nearly every major personal and social problem affecting a large number of modern citizens involves some kind of failure of self-regulation.” Baumeister and Vohs provide examples of problems with self-regulation such as drug addiction, obesity, excessive spending, violence, emotional problems, health problems, underachievement,

procrastination, sexually transmitted diseases, and clinical phenomena like attention-deficit/hyperactivity disorder.

Understanding how mindfulness may influence neuroticism's relationship with impulsivity and self-control will not only be useful for self-regulation clinically, but will also further the field's understanding of how these associations add depth and nuance to understanding mindfulness as a concept and clinical tool. For these purposes the current study serves to replicate and extend the results of the studies conducted by Fetterman et al. (2010) in a new, broader sample. The following sections describe the variables studied in more detail.

Mindfulness

Mindfulness is described as an open and detached but engaged manner of monitoring and relating to internal and external stimuli (Brown, Ryan & Creswell, 2007). It was defined by Brown and Ryan (2003) as “a receptive attention to and awareness of present events and experience.” Kabat-Zinn (2003) offered one of the most commonly used definitions of mindfulness: “the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment.”

Mindfulness has been used in Western psychology for specific therapeutic interventions. Some of these therapies include Dialectical Behavior Therapy (DBT), Acceptance and Commitment Therapy (ACT), Mindfulness-Based Stress Reduction (MBSR), and Mindfulness-Based Cognitive Therapy (MBCT). A review of these therapies demonstrates the usefulness of mindfulness in therapeutic applications, including for targeting issues with negative affect, self-control, and impulsivity.

DBT has demonstrated significant effectiveness in reducing impulsive and suicidal behaviors in patients suffering from borderline personality disorder along with significant improvements in ratings of depression, dissociation, anxiety and stress (Bohus et al., 2000). In DBT mindfulness practice helps individuals with borderline personality disorder in four overlapping ways: (1) increasing attentional control, (2) increasing awareness of private experience, (3) decreasing impulsive action, and (4) increasing self-validation (Lynch, Chapman, Rosenthal, Kuo, & Linehan, 2006).

In ACT, mindfulness is defined as consisting of acceptance, cognitive defusion (separation of thoughts from objective reality), and attention to present experience in order to understand the self in the context of the present moment (Hayes & Shenk, 2004). By increasing acceptance, defusion, and attention, ACT has been shown to reduce symptoms and rehospitalizations in psychotic patients over a 4-month period (Bach & Hayes, 2002). A combination of ACT and DBT was found to reduce self-harming behaviors and improve measures of emotion regulation, mental health, and stress in borderline personality disorder patients at the end of treatment (Gratz & Gunderson, 2006).

Mindfulness-Based Stress Reduction (MBSR) is a group mindfulness meditation program that targets alleviating physical, psychosomatic and psychiatric suffering and disorders (Grossman et al., 2003). Randomized clinical trials of MBSR, most using wait-list controls, show that MBSR is effective in reducing self-reported distress (Monti, Peterson, Shakin, Kunkel, Hauck, Pequignot, Rhodes et al., 2005; Tacón, McComb, Caldera, & Randolph, 2003), while increasing affect regulation (Tacón et al., 2003), perceptions of control (Astin, 1997), and mindfulness (Cohen-Katz, Wiley, Capuano, Baker, & Shapiro, 2005).

Mindfulness-Based Cognitive Therapy (MBCT) is a therapy employing mindfulness techniques that targets depression (Coelho, Canter & Ernst, 2007). In a multi-center randomized clinical trial by Teasdale et al. (2000), it was found that MBCT significantly reduced relapse rates in patients with three or more previous episodes of depression, with 66% of those in the treatment as usual group compared to 40% of those in the MBCT group suffering from relapse.

Across these therapeutic applications of mindfulness, the individual is being taught: 1) to be aware of personal triggers and habitual reactions, 2) to create a pause in seemingly automatic processes, 3) to change one's relationship to discomfort, 4) to recognize challenging emotional and physical experiences and respond to them skillfully, and 5) foster a nonjudgmental, compassionate and accepting approach toward the self and one's experiences. The research findings for these various therapeutic applications of mindfulness speak to the richness and broad applicability of its use and provide evidence of the effectiveness of mindfulness for fostering self-awareness and self-regulation to treat clinical diagnoses which often implicate disordered affect as well as issues with self-control and impulsivity.

Neuroticism, Impulsivity, and Self-control: The Role of Mindfulness

Neuroticism is the enduring tendency to experience negative emotional states including anxiety, moodiness, worry, envy and/or jealousy (Thompson, 2008). Neuroticism may link to increased failure to identify problematic behaviors due to lack of awareness and the distracting effects of rumination as well as increased investment of resources and effort toward goals that were not pursuits previously (Beng-Chong & Ployhart, 2006; Carver, 2004; Tangney et al., 2004). Previous research has also shown that neuroticism is associated with automatic orienting

of attention and the impairment of one's ability to evaluate and correct problematic habitual thoughts and behaviors (Wallace & Newman, 1997).

Mindfulness can enhance monitoring and attention, and increased levels can break “mindless emoting” (rumination) that can lead to anxious worry and depression. The negative thought that would otherwise activate rumination is observed and appraised, interrupting the obsession and globalization that escalates negative affect (Breslin, Zack, & McMain, 2006). Mindfulness encourages examination of emotions rather than reaction and anxious pursuit of “fighting off” negative stimuli, promoting extinction of maladaptive responses, such as substance abuse (Breslin et al., 2006). It has been found that increased mindfulness negatively correlates with neuroticism, anxious arousal, depression, and emotion dysregulation (Gonzalez, Vujanovic, Johnson, Leyro, & Zvolensky, 2009; Jacobs et al., 2011). In a recent functional magnetic resonance imaging (fMRI) study in which subjects performed an emotional expectation paradigm by viewing emotional pictures that had either positive or negative attributes, subjects in the mindful group had increased activation in the prefrontal regions and reduced processing in the amygdala and parahippocampal gyrus (areas associated with emotional processing) during the expectation of negative pictures compared to controls, demonstrating increased self-regulation in the presence of negative emotional stimuli among those with mindfulness training on a neurobiological level (Lutz et al., 2013). Lutz et al.'s finding points to mindfulness as a potentially useful tool for reducing reactivity to negative affect and increasing executive function.

In fact, the literature has discussed the use of mind-body therapies such as mindfulness for regulation and revision of the limbic system in the brain to facilitate optimal emotion regulation. Evidence suggests that mind-body interventions such as mindfulness can facilitate

neural integration to a) help regulate emotional experience, and b) help regulate emotions during interactions with others to facilitate empathic and mutually supportive relationships (Lewis, Amini, & Lannon, R., 2001; Siegel, 2007). Therapists can potentially use mindfulness as a clinical tool to foster limbic revision, working with clients to transform dysfunctional patterns of emotion-laden thought and behavior in favor of emotion management and associated behaviors that are more balanced and secure. Mindfulness may be useful as a limbic revision tool by acting as a gateway for therapists to access the clients' emotions in a non-threatening, gentle, and exploratory manner (Lewis, Amini, & Lannon, R., 2001). Meditation, one form of practicing mindfulness, can be a useful clinical tool to facilitate emotion regulation by heightening awareness to promote healing, neural integration and neuroplasticity in neural systems relevant for emotion regulation. The results of meditation for emotion regulation include: a) increased activation of the left frontal regions of the brain, which lifts mood (Davidson 2004); b) decreased stress-related cortisol (Tang et al., 2007); c) alleviated psychological conditions related to negative affect such as insomnia, anxiety, phobias, and eating disorders (Walsh and Shapiro, 2006); d) decreased volume of the amygdala along with balance of the hippocampal/amygdala axis (balanced processing of emotions for memory) (Hanson & Mendius, 2009; Siegel, 2007); and, e) higher activation of the parasympathetic nervous system (PNS) and reduced activation of the sympathetic nervous system (SNS) (Hanson & Mendius, 2009; Siegel, 2007). The culmination of these findings suggests that the field would benefit from further exploration of mindfulness to potentially transform one's relationship to emotions in order to not only decrease suffering but also potentially foster optimal self-regulation.

Impulsivity and Behavioral Regulation

Loss of self-awareness causes behavior to become more impulsive and responsive to cues of the moment (Diener, 1979; Hull & Sloane, 2004). For example, impulsive adolescents are more prone to becoming regular smokers because they are more vulnerable to peer pressure and temptation (Baumeister, Heatherton, & Tice, 1994). Other research has found that young adults with heightened impulsivity demonstrate increased unhealthy eating habits (Jasinska et al., 2012). Failure to transcend impulses occurs when individuals only attend to immediate urges and do not monitor and regulate discrepancies between current interests and long-term goals. Research shows that, if exercised, attention and monitoring can override impulses in conditions such as addiction (Sayette, 2004). DBT, a mindfulness therapy, has demonstrated significant effectiveness in reducing impulsive and suicidal behaviors in people with borderline personality disorder (Bohus et al., 2000). A dispositional tendency to be mindful could be important for counteracting impulses by interfering with lapses in monitoring that may contribute to self-regulation failure and impulsive behavior.

Expanding on this notion, recently researchers have begun exploring the Reflective Impulsive Model (RIM) for health behavior (Hofmann, Friese, & Wiers, 2008). In this model, impulses are assumed to be triggered by internal or external stimuli and affective responses that activate long-term memory associations that have produced habitual and reactive behavioral tendencies. As an example, a stressor may trigger worry and stress which, when paired with nearby chocolate candy (immediate reward) may over time produce a habit of consuming chocolate when stressed to reduce negative affect. On the other hand, the reflective system of this model employs higher-order mental operations which allow greater flexibility and control over decisions and actions. These operations include executive functions (reasoned judgments

and evaluations, plans for goal-pursuit, and overriding impulses). The RIM model suggests that health-related outcomes may often result from the interplay between impulsive and reflective processes. This model could potentially be expanded to behavior influenced by negative affect in general, in which case one might understand negative affect to be a condition, that when overridden, no longer predisposes the individual to impulsive tendencies. Mindfulness, a self-awareness practice, could enhance reflective processes to curtail impulsive and habitual/automatic responding to negative stimuli.

Self-control and Behavioral Regulation

Self-control as assessed in the current study in the Self-Control Scale is defined by response inhibition and impulse control: “Central to our concept of self-control was the ability to override or change one’s inner responses, as well as to interrupt undesired behavioral tendencies (such as impulses) and refrain from acting on them,” (Tangney et al., 2004). In Tangney et al.’s article about the development and application of the measure, the researchers described findings that higher scores on the scale predicted higher levels of subjective well-being (higher self-esteem, emotional stability, and conscientiousness), lower levels of psychopathology (lower scores on eating disorder scales, alcohol abuse scales, and a range of other clinical diagnoses), higher grades, and better interpersonal functioning (Tangney et al., 2004).

Other research has also suggested that individuals with low self-control struggle with maintaining adaptive behaviors and goals. For example, people with low self-control have been found to be more prone to break diets and indulge in alcohol (Muraven, Collins, & Neinhuis, 2002). Researchers on self-control and self-regulation have found that self-control failures lead

to negative health and social consequences such as obesity, substance use, aggression, unwanted pregnancies, and crime (Baumeister, Heatherton, & Tice, 1994; Sayette, 2004).

Extending previous findings to the association between self-control and mindfulness, it was found in one study that participants who had used mindfulness meditation after emotion suppression performed equally well on a subsequent self-control task as participants who had not exerted self-control previously, while those who had not used mindfulness performed worse after emotion suppression (Frieze, Messner, & Schaffner, 2012). Frieze et al. (2012) point out that mindfulness has been shown to improve emotion regulation, attention regulation, and executive functioning such as working memory and response inhibition, which may explain the results. Research has demonstrated that trait mindfulness moderates the relationship between intentions to smoke and smoking frequency in teens ($n = 5,287$), such that when mindfulness was higher the relationship between intentions to smoke and smoking frequency was weaker. In the same study the relationship between smoking refusal self-efficacy and smoking frequency was also moderated by mindfulness, such that when mindfulness was higher smoking refusal self-efficacy had a stronger influence on smoking frequency (smoking frequency decreased). Black et al. concluded that mindfulness may foster decision-making that reduces adolescents' risk for smoking (Black, Sussman, Johnson, & Milam, 2012).

In addition, recent research has found that a short-term mindfulness meditation training was associated with increased connectivity in white matter in areas of the brain relevant to self-regulation (Tang et al., 2010). Research on the mechanisms of mindfulness proposes that attention and emotion regulation are two of several key mechanisms of mindfulness that may be associated with neuroplastic changes working synergistically to establish a process of enhanced self-regulation (Holzel et al., 2011). Exploring associations between self-awareness

and self-regulation as fostered by mindfulness seems useful to guide future basic research and to specifically target areas of development in the treatment of psychological disorders.

Summary and Hypothesis

The research described here points to theoretical and applied support for neuroticism as a determinant of behavioral dysregulation, and a need to explore the potential use of mindfulness to mediate neuroticism's effects on behavior. The current study followed the methods used by Fetterman and colleagues with the hypothesis that their results would be replicated, confirming mindfulness as a mediator between neuroticism and behavioral dysregulation. Replication in a new, broader sample (the previous research included college students only) would further strengthen the evidence for the previous findings, and would inform researchers about the basic underlying associations between these variables in order to begin to explore the translational utility of mindfulness for enhancing behavioral regulation in future research both broadly and for specific diagnoses. In the current study it was hypothesized that a) neuroticism is an inverse predictor of mindfulness; b) higher levels of mindfulness are associated with lower levels of impulsivity; c) higher levels of mindfulness are associated with higher levels of self-control; and d) mindfulness will mediate between neuroticism and self-control and impulsivity outcomes.

CHAPTER 2: METHODS

Participants

A total of 288 volunteers submitted responses to the survey, with a total of 244 participants completing the entire survey (84.7%)¹ (note: although the original total sample was 288, one individual, discovered to be a minor, was eliminated from further data analysis, making the total sample size 287). With a sample size of 287, there is 93% power to detect a significant correlation if the true correlation is .2 or higher based on Fisher's r-to-z test with a 95%, two-sided significance level. Volunteers were recruited from American University in the mid-Atlantic Metropolitan Washington D.C. area as well as the Washington D.C. Craigslist.org classifieds and other social networking sites.

Measures

Participants completed one online questionnaire containing a brief demographic form and the same self-report measures of neuroticism, mindfulness, and self-control used in Fetterman et al.'s research (2010). These same measures were carried over into the current study because 1) they were confirmed to have psychometrically sound properties as described in further detail under each measure section and 2) using the same measures would facilitate comparison of replication results. An exception was made for the Eysenck Impulsivity Scale, which was replaced with the more recently developed Barratt Impulsiveness Scale – 11 (see "Barratt

1

The study was initially designed to evaluate the measures in adult smokers and nonsmokers. About 19% of the adult population in the U.S. smokes (Centers for Disease Control, 2010). This proportion was used to calculate the power analysis. The analysis showed that a minimum of 166 volunteers were needed to complete the study. For a 90% confidence interval, the power analysis indicated a minimum of 166 participants: $n = (1.645)^2 (.19) (.81) / (.05)^2 = 166$; for a 95 % confidence interval, the power analysis indicated a minimum of 236 participants: $n = (1.96)^2 (.19) (.81) / (.05)^2 = 236$.

Impulsiveness Scale -11” section for explanation and further details). The following sections include descriptions of the demographics form and the self-report measures.

Demographics Questionnaire

Participants were asked to provide demographic information about age, race (checking all that apply: Caucasian, Black/African American, American Indian/Alaska Native, Hawaiian Native/Pacific Islander, Hispanic/Latino/a, Other), gender, education (i.e., not a high school graduate, high school diploma or GED, some college or associate’s degree, bachelor’s degree, some graduate coursework, or advanced degree), whether they have had previous exposure to mindfulness training, and regularity of mindfulness practice (if applicable) (i.e., more than once a week, once a week, two to three times a month, once a month, and less than once a month). To guide participants in determining whether they had any prior exposure to mindfulness training, participants were provided the following prompt in the demographics questionnaire: “One definition of mindfulness is ‘open and receptive attention and awareness to the present moment’ (Brown & Ryan, 2003). Have you had previous exposure to mindfulness training (for example, mindfulness meditation)?” A copy of the Demographics Questionnaire is provided in Appendix A.

International Personality Item Pool – Neuroticism Scale (IPIP-N)

Neuroticism was assessed with Goldberg’s (1999) 10-item scale (*Mean response* = 3.10, *SD* = .69) (Beng-Chong & Ployhart, 2006). Individuals were asked the extent to which items reflective of neuroticism, such as getting stressed easily and feeling blue, generally described the self (1 = very inaccurate to 5 = very accurate). The scale shows concurrent validity, correlating

strongly with the NEO-Personality Inventory (NEO-PI) neuroticism scale ($r = .82$) and has demonstrated excellent reliability ($\alpha = .86$) (Goldberg et al., 2006). In the current study, the Cronbach's alpha coefficient was .877, consistent with previously reported internal statistics. The scale is scored by reversing values of appropriate items and summing the total of the 10 questions.

Barratt Impulsiveness Scale – Version 11 (BIS)

Impulsivity was assessed with the Barratt Impulsiveness Scale – Version 11 (1995) (*Mean total score sum* = 64.2, *SD* = 10.7; *Mean response* = 2.14, *SD* = .36) (Spinella, 2007). The BIS is a 30-item, self-rating scale measuring aspects of impulsivity. There are three subscales: non-planning, motor impulsivity, and attentional impulsivity (Patton et al., 1995). Representative items include: “I plan tasks carefully” (non-planning, reverse scored item), “I act on impulse” (motor impulsivity), and “I concentrate easily” (attentional impulsivity, reverse scored item). Items are rated on a scale of 1 = rarely/never to 4 = almost always. There is high reliability (Cronbach's alpha = .83) and convergent validity with the Eysenck Impulsiveness Scale ($r = .63$ for Impulsiveness factor) (Stanford et al., 2009). In the current study, the Cronbach's alpha coefficient was .857, consistent with previously reported internal statistics.

While Fetterman et al. used the Eysenck Personality Inventory – Impulsivity (1977), the current study uses the BIS-11 because it has subscales useful for exploring attentional, motor, and planning aspects of impulsivity that may associate with executive functioning substrates of mindfulness (Frieze, Messner, & Schaffner, 2012; Holas & Jankowski, 2012; Holzel et al., 2011). The attentional subscale evaluates (in-)ability to focus attention or concentrate; the motor impulsiveness subscale evaluates acting without thinking, and the non-planning subscale

evaluates (lack of) forethought (Stanford et al., 2009). In addition the BIS has taken more recent research on impulsiveness into consideration in its development as demonstrated by the fact that it has been updated 11 times since its initial publication in 1959 (Stanford et al., 2009). The BIS is scored by reversing values of appropriate items and summing the total of the 30 questions.

Mindful Attention and Awareness Scale (MAAS)

Mindfulness was assessed using Brown and Ryan's (2003) 15-item scale which is targeted to dispositional mindfulness (*Mean total score* = 4; *SD* = .81) (MacKillop & Anderson, 2007). Participants were asked to rate the extent to which the items characterize the self, such as "It seems I am 'running on automatic' without much awareness of what I am doing," on a scale of 1 = almost always to 6 = almost never. The scale has been validated with college, community, and cancer patient samples (Brown & Ryan, 2003). Cronbach's alpha in a general adult sample was found to be .87 (Brown & Ryan, 2003). In the current study, the Cronbach's alpha coefficient was .891, consistent with previously reported internal statistics. The scale is scored by finding the mean of the 15 items.

Brief Self-Control Scale (bSCS)/ Self-control Scale (SCS)

Tangney et al.'s 2004 36-item scale is used to assess participants' self-control (*Mean total score sum* = 114.47, *SD* = 18.81; *Mean response* = 3.18, *SD* = .52). The scale demonstrates good reliability (Cronbach's alpha = .89) and correlates to other measures associated with self-control and impulsiveness, such as the Eating Disorder Inventory ($r = -.28$) and the Michigan Alcohol Screening Test ($r = -.31$), and Big Five personality traits, in particular conscientiousness

($r = .54$) and emotional stability ($r = .50$) (which corresponds to neuroticism) (Tangney, Baumeister, & Boone, 2004). In the current study, the Cronbach's alpha coefficient for the full SCS was .914, consistent with previously reported internal statistics. Participants are asked to rate the extent to which a series of statements reflecting high and low levels of self-control generally characterize the self. Statements such as "I never allow myself to lose control," reflect high levels of concern over self-control, whereas statements such as "I am lazy" reflect low levels of self control. Statements are rated on a scale of 1 = Not at all to 5 = Very much. In support of the validity of this scale, Tangney et al. found that higher scores predicted higher levels of subjective well-being, lower levels of psychopathology, higher grades, and better interpersonal functioning. The scale is scored by reversing values of appropriate items and finding the mean of the 36 questions. Results were also analyzed utilizing the brief version of the SCS (bSCS) for the purpose of comparing results to Fetterman et al.'s, as they had used the bSCS in their own analyses. The bSCS is a 13-item version of Tangney et al.'s full 36-item SCS. In analyzing the utility of the bSCS, Tangney et al. found that it had correlations of .93 and .92 with the full Self-Control Scale in two separate studies. They also asserted that the bSCS covers the same range of content as the full SCS.

Procedures

Participants were recruited using fliers placed throughout American University campus located in the District of Columbia. In addition, participants were recruited by emails sent out over the American University list serve, classified advertisement on Craigslist.org, and other social networking sites. Each of these recruitment methods provided participants with a link which directed them to the website hosting the survey (www.SurveyMonkey.com). All data collection was performed online. Upon reaching the online questionnaire, participants received a

set of instructions to complete the survey which included information about potential compensation and a statement of implied consent. Compensation was the participants' choice of entry into a lottery for a \$50 Visa gift card or a free guided mindfulness meditation CD. Once participants confirmed consent to participate on the implied consent form by clicking "I freely consent to participate" they were directed to the Demographics Questionnaire. Participants who clicked "I decline to participate" were redirected to a page exiting the online questionnaire. Questions on all measures except the Demographics Questionnaire were randomized. Certain questions on the Demographics Questionnaire were dependent upon the answer of previous questions on the questionnaire, precluding question randomization (see Appendix A). All data collected on the web was coded into statistical software, thereby removing all identifying information. Statistical software was then used to run analyses as described in the results section.

CHAPTER 3: RESULTS

Demographics

The mean age among the participants was 29.6 ($SD = 13.02$; $n = 252$; non-responder $n = 35$; note: although the original total sample was 288, one individual was discovered to be a minor, and was therefore eliminated from further data analysis, making the total sample size 287). 76.7% of participants identified themselves as Caucasian ($n = 220$); 5.6% as Black/African American ($n = 16$); 0.7% as American Indian/Alaska Native ($n = 2$); 1% as Hawaiian Native/Pacific Islander ($n = 3$); 4.5% as Hispanic/Latino/a ($n = 13$); and 7.3% as Other ($n = 21$). 12 individuals (4.2%) did not respond to this question. 24% of the participants identified themselves as male ($n = 69$) and 71.1% identified themselves as female ($n = 204$) (total $n = 273$; non-responder $n = 14$). In response to “What is the highest level of education you have completed?” 0.3% ($n = 1$) of participants indicated “not a high school graduate,” 13.9% ($n = 40$) indicated “high school diploma or GED,” 30.3% ($n = 87$) indicated “some college or associate’s degree,” 11.8% ($n = 34$) indicated “bachelor’s degree,” 14.3% ($n = 41$) indicated “some graduate coursework,” and 25.1% ($n = 72$) indicated “advanced degree,” (total $n = 275$; non-responder $n = 12$).

Correlations Among Measures

Mean scores and standard deviations for each of the questionnaires in the current sample were as follow: neuroticism (sum score $M = 25.66$; $SD = 7.75$, $n = 250$; response $M = 2.56$), mindfulness ($M = 3.91$; $SD = .79$, $n = 256$), self-control ($M = 3.36$; $SD = .56$, $n = 254$), and impulsivity (sum score $M = 60.96$; $SD = 10.80$, $n = 253$; response $M = 2.03$). The sample size from scale to scale varied in line with participant response. Variables underwent preliminary

analyses to ensure there were no violations of the assumptions of normality, linearity, and homoscedasticity. Scatterplots revealed data points were clustered linearly. One outlier was discovered, but because correlations remained virtually the same with and without the outlier, it was determined that the outlier could be kept in the data for further analysis. No extreme outliers (defined as more than 3 box-lengths from the variable boxplots) were found. A matrix of the correlations for all measures is provided here.

Table 1: Correlations Among Measures

		Correlations							
		Sum Score IPIP-N	Mean Score MAAS	Mean Score SCS	Mean Score bSCS	Sum Score BIS	BIS Attentional	BIS Motor	BIS Nonplanning
Sum Score IPIP-N	Pearson Correlation	1	-.416**	-.457**	-.433**	.283**	.430**	.075	.207**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.239	.001
	N	250	248	246	246	246	246	246	246
Mean Score MAAS	Pearson Correlation	-.416**	1	.516**	.490**	-.483**	-.576**	-.312**	-.323**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000
	N	248	256	249	249	247	247	247	247
Mean Score SCS	Pearson Correlation	-.457**	.516**	1	.941**	-.752**	-.599**	-.576**	-.681**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000
	N	246	249	254	254	245	245	245	245
Mean Score bSCS	Pearson Correlation	-.433**	.490**	.941**	1	-.712**	-.546**	-.552**	-.656**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000
	N	246	249	254	254	245	245	245	245
Sum Score BIS	Pearson Correlation	.283**	-.483**	-.752**	-.712**	1	.766**	.818**	.873**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000	.000
	N	246	247	245	245	253	253	253	253
BIS Attentional Impulsiveness	Pearson Correlation	.430**	-.576**	-.599**	-.546**	.766**	1	.424**	.497**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000
	N	246	247	245	245	253	253	253	253
BIS Motor Impulsiveness	Pearson Correlation	.075	-.312**	-.576**	-.552**	.818**	.424**	1	.604**
	Sig. (2-tailed)	.239	.000	.000	.000	.000	.000		.000
	N	246	247	245	245	253	253	253	253
BIS Nonplanning Impulsiveness	Pearson Correlation	.207**	-.323**	-.681**	-.656**	.873**	.497**	.604**	1
	Sig. (2-tailed)	.001	.000	.000	.000	.000	.000	.000	
	N	246	247	245	245	253	253	253	253

** . Correlation is significant at the 0.01 level (2-tailed).

Neuroticism

Replicating Fetterman et al.'s results, neuroticism was significantly negatively correlated with mindfulness ($r = -.416$, $n = 248$, $p < .001$) and self-control (full SCS: $r = -.457$, $n = 246$, $p < .001$; bSCS: $r = -.433$, $n = 246$, $p < .001$). Neuroticism was significantly positively correlated with overall impulsiveness ($r = .283$, $n = 246$, $p < .001$). The current study also conducted

additional analyses of the BIS-11 impulsivity subscales, which revealed that neuroticism was significantly positively associated with attentional impulsiveness ($r = .430, p < .001$) and motor impulsiveness ($r = .207, p = .001$) and showed almost no correlation with motor impulsiveness ($r = .075, p = .239$). Thus, high levels of neuroticism were associated with lower levels of mindfulness and self-control and were associated with overall higher levels of impulsiveness.

Mindfulness

In the current study the associations to mindfulness were similar to those in Fetterman et al.'s findings. Mindfulness was significantly negatively associated with neuroticism ($r = -.416, n = 248, p < .001$) and impulsiveness ($r = -.483, n = 247, p < .001$). Meanwhile, it was significantly positively associated with self-control (full SCS: $r = .516, n = 249, p < .001$; bSCS: $r = .490, n = 249, p < .001$). Exploring the association between mindfulness and impulsivity further, results showed that mindfulness was most negatively correlated with attentional impulsivity ($r = -.576, p < .001$), followed by nonplanning impulsivity ($r = -.323, p < .001$) and motor impulsivity ($r = -.312, p < .001$). Overall, high levels of mindfulness were associated with higher self-control and lower neuroticism and impulsiveness.

Self-Control

In line with Fetterman et al.'s previous findings (2010), in the current study self-control significantly negatively correlated with neuroticism (full SCS: $r = -.457, n = 246, p < .001$; bSCS: $r = -.433, n = 246, p < .001$) and significantly positively correlated with mindfulness (full SCS: $r = .516, n = 249, p < .001$; bSCS: $r = .490, n = 249, p < .001$). As would be expected, the full SCS and bSCS were highly correlated with each other ($r = .941, n = 254, p < .001$). In the current

study, self-control was negatively associated with impulsivity (full SCS: $r = -.752$, $n = 245$, $p < .001$; bSCS: $r = -.712$, $n = 245$, $p < .001$). Analyzing the association between self-control and impulsivity further, impulsiveness subscale analyses showed that self-control was significantly negatively associated with attentional impulsiveness (full SCS: $r = -.599$, $p < .001$; bSCS: $r = -.546$, $p < .001$), motor impulsiveness (full SCS: $r = -.576$, $p < .001$; bSCS: $r = -.552$, $p < .000$), and nonplanning impulsiveness (full SCS: $r = -.681$, $p < .001$; bSCS: $r = -.656$, $p < .001$). The current findings show that higher self-control was associated with higher mindfulness and lower neuroticism and impulsivity.

Impulsivity

Impulsivity results are provided in the other results sections. Results for the overall BIS are repeated here to facilitate review. Impulsivity significantly positively associated with neuroticism ($r = .283$, $n = 246$, $p < .001$). Conversely, impulsiveness significantly negatively associated with mindfulness ($r = -.483$, $n = 247$, $p < .001$). Furthermore, impulsiveness significantly negatively associated with self-control (full SCS: $r = -.752$, $n = 245$, $p < .001$; bSCS: $r = -.712$, $n = 245$, $p < .001$). Impulsiveness subscale analyses described in previous sections reinforce these overall findings. The findings show that higher impulsivity was associated with higher neuroticism and lower mindfulness and self-control.

Comparison of Correlations between Those with and without Previous Mindfulness Exposure

In addition to reviewing overall correlations among measures, correlations for all measures were compared between those with and without previous exposure to mindfulness (total $n = 275$, non-responder $n = 12$). The correlation matrices are included here.

Table 2: Correlations: Participants with Previous Exposure to Mindfulness

Correlations: with previous exposure to mindfulness									
		Sum Score IPIP-N	Mean Score MAAS	Mean Score SCS	Mean Score bSCS	Sum Score BIS	BIS Attentional	BIS Motor	BIS Nonplanning
Sum Score IPIP-N	Pearson Correlation	1	-.402**	-.584**	-.545**	.377**	.513**	.147	.261**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.137	.007
	N	107	106	106	106	104	104	104	104
Mean Score MAAS	Pearson Correlation	-.402**	1	.420**	.404**	-.376**	-.513**	-.254**	-.163
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.009	.099
	N	106	107	105	105	104	104	104	104
Mean Score SCS	Pearson Correlation	-.584**	.420**	1	.953**	-.744**	-.500**	-.605**	-.664**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000
	N	106	105	107	107	104	104	104	104
Mean Score bSCS	Pearson Correlation	-.545**	.404**	.953**	1	-.685**	-.446**	-.546**	-.633**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000
	N	106	105	107	107	104	104	104	104
Sum Score BIS	Pearson Correlation	.377**	-.376**	-.744**	-.685**	1	.717**	.814**	.854**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000	.000
	N	104	104	104	104	104	104	104	104
BIS Attentional Impulsiveness	Pearson Correlation	.513**	-.513**	-.500**	-.446**	.717**	1	.357**	.407**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000
	N	104	104	104	104	104	104	104	104
BIS Motor Impulsiveness	Pearson Correlation	.147	-.254**	-.605**	-.546**	.814**	.357**	1	.585**
	Sig. (2-tailed)	.137	.009	.000	.000	.000	.000		.000
	N	104	104	104	104	104	104	104	104
BIS Nonplanning Impulsiveness	Pearson Correlation	.261**	-.163	-.664**	-.633**	.854**	.407**	.585**	1
	Sig. (2-tailed)	.007	.099	.000	.000	.000	.000	.000	
	N	104	104	104	104	104	104	104	104

** . Correlation is significant at the 0.01 level (2-tailed).

Table 3: Correlations: Participants with No Previous Exposure to Mindfulness

Correlations: no previous exposure to mindfulness									
		Sum Score IPIP-N	Mean Score MAAS	Mean Score SCS	Mean Score bSCS	Sum Score BIS	BIS Attentional	BIS Motor	BIS Nonplanning
Sum Score IPIP-N	Pearson Correlation	1	-.414**	-.364**	-.368**	.223**	.378**	.021	.173
	Sig. (2-tailed)		.000	.000	.000	.008	.000	.804	.039
	N	143	142	140	140	142	142	142	142
Mean Score MAAS	Pearson Correlation	-.414**	1	.584**	.559**	-.559**	-.625**	-.361**	-.439**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000
	N	142	149	144	144	143	143	143	143
Mean Score SCS	Pearson Correlation	-.364**	.584**	1	.935**	-.759**	-.678**	-.553**	-.695**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000
	N	140	144	147	147	141	141	141	141
Mean Score bSCS	Pearson Correlation	-.368**	.559**	.935**	1	-.733**	-.627**	-.560**	-.674**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000
	N	140	144	147	147	141	141	141	141
Sum Score BIS	Pearson Correlation	.223**	-.559**	-.759**	-.733**	1	.805**	.825**	.888**
	Sig. (2-tailed)	.008	.000	.000	.000		.000	.000	.000
	N	142	143	141	141	149	149	149	149
BIS Attentional Impulsiveness	Pearson Correlation	.378**	-.625**	-.678**	-.627**	.805**	1	.483**	.569**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000
	N	142	143	141	141	149	149	149	149
BIS Motor Impulsiveness	Pearson Correlation	.021	-.361**	-.553**	-.560**	.825**	.483**	1	.622**
	Sig. (2-tailed)	.804	.000	.000	.000	.000	.000		.000
	N	142	143	141	141	149	149	149	149
BIS Nonplanning Impulsiveness	Pearson Correlation	.173	-.439**	-.695**	-.674**	.888**	.569**	.622**	1
	Sig. (2-tailed)	.039	.000	.000	.000	.000	.000	.000	
	N	142	143	141	141	149	149	149	149

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

The nature of the associations between the measures did not dramatically change based on exposure status. Correlations between those with and without previous exposure to mindfulness were compared to evaluate whether there were any significant differences (two-tailed) between the two groups using a VassarStats calculator designed for this purpose (Lowry, 2013). Since none of the overall impulsivity correlation pairs were significantly different, significance of the difference between correlations coefficients for impulsivity subscales between the two groups were not evaluated. The results revealed only one correlation pair that demonstrated a statistically significant difference between the two groups: neuroticism and self-control (IPIP/SCS).

Table 4: Evaluation of Differences Between Correlation Coefficients: Participants with Versus without Previous Exposure to Mindfulness

Evaluation of differences between correlation coefficients: participants with versus without previous exposure to mindfulness	
Correlation Pairs	Significance
IPIP/MAAS	p = .912
IPIP/SCS	p = .028
IPIP/BIS	p = .194
MAAS/SCS	p = .089
MAAS/BIS	p = .070
SCS/BIS	p = .795

The correlations for neuroticism and self-control between those with ($r = -.584$, $p < .001$, $n = 106$) and without ($r = -.364$, $p < .001$, $n = 140$) previous exposure to mindfulness show that those who endorsed previous exposure to mindfulness also endorsed a stronger negative association between neuroticism and self-control than those who did not have previous exposure to mindfulness. The difference between these associations for the two groups was statistically significant, $p = .028$.

Mean Mindfulness Based on Prior Exposure to Mindfulness

An independent samples t-test was conducted to compare mean mindfulness scores between participants who did and did not endorse having previous exposure to mindfulness. This was determined by participants' responses to the statement and question: "One definition of mindfulness is "open and receptive attention and awareness to the present moment" (Brown & Ryan, 2003). Have you had previous exposure to mindfulness training (for example, mindfulness meditation)?" Of the 256 participants who answered the question, 107 responded "yes," and 149 responded "no." There was no significant difference in mean MAAS scores for those with ($M = 3.83$, $SD = .768$) and without previous exposure to mindfulness training ($M = 3.97$, $SD = .812$; $t(256) = -1.44$, $p = .151$, two-tailed). The magnitude of the differences in the means (mean difference = $-.14$, 95% CI: $-.34$ to $.05$) was very small (eta squared = $.0039$), indicating only 0.39% of the variance in mindfulness in the current sample was explained by participants' reported previous exposure.

Mean Mindfulness Based on Frequency of Current Mindfulness Practice

The correlation between practice frequency and mindfulness variables underwent preliminary analyses to ensure there were no violations of the assumptions of normality, linearity, and homoscedasticity. There was almost no association between frequency of current mindfulness practice and mean mindfulness score, ($r = .037$, $p = .791$, $n = 55$), though it is noted that the sample size for those reporting a current practice was fairly small ($n = 55$) and among those with a current practice, only 24 individuals reported practicing more than once a week.

Mean Mindfulness Based on Age, Race/ethnicity, Gender, and Education

Age

The correlation between age and mindfulness variables underwent preliminary analyses to ensure there were no violations of the assumptions of normality, linearity, and homoscedasticity. Age had one outlier, which was removed from analysis. Age was positively thought modestly associated with MAAS score ($r = .169$, $p = .01$).

Race and Ethnicity

A one-way between-groups analysis of variance was conducted to explore the impact of race and ethnicity on levels of mindfulness as measured by the MAAS. Participants were divided into groups according to self-selected race/ethnicity from the following categories: Group 1: Caucasian, Group 2: Black/African American, Group 3: American Indian/Alaska Native, Group 4: Hawaiian Native/Pacific Islander, Group 5: Hispanic/Latino/a, Group 6: Other. Participants had the option to select more than one category if applicable. Since only 12 individuals selected more than one group, there were too few of these individuals to provide data for analysis of bi- or multiracial impact on levels of mindfulness, and they were therefore removed from the analysis. Subsequently Group 4 was eliminated because after removing participants who indicated multiple races, only 1 individual remained in that group. There was not a statistically significant difference in MAAS scores for the remaining groups: $F(3, 244) = .661$, $p = .577$.

Specifically, mean MAAS scores by group were as follow: Group 1: $M = 3.91$; Group 2: $M = 4.23$; Group 3: n/a ; Group 4: $M = n/a$; Group 5: $M = 3.80$; Group 6: $M = 3.88$.

Gender

An independent-samples t-test was conducted to compare mindfulness scores for males and females. The results were virtually identical. There was no significant difference for males ($M = 3.88$, $SD = .97$) and females ($M = 3.92$, $SD = .73$; $t(254) = -.287$, $p = .77$, two-tailed). Note that of the 256 participants who completed the MAAS, two did not provide data on gender.

Education

A one-way between-groups analysis of variance was conducted to explore the impact of education on levels of mindfulness as measured by the MAAS. Participants were divided into groups according to education by selecting from the following categories: Group 1: Not a high school graduate; Group 2: High school diploma or GED; Group 3: Some college or associate's degree; Group 4: Bachelor's degree; Group 5: Some graduate coursework; Group 6: Advanced degree. Since Group 1 only included one participant, it could not be used in post-hoc analyses comparing means between groups, and therefore was eliminated. This left 255 participants remaining who had provided data for education and the MAAS. There was not a statistically significant difference for the groups: $F(4, 255) = .594$, $p = .668$. Specifically, mean MAAS scores by group were as follow: Group 1: eliminated from analysis; Group 2: $M = 3.93$; Group 3: $M = 3.81$; Group 4: $M = 3.88$; Group 5: $M = 3.95$; Group 6: $M = 4.01$.

Multiple Regressions to Predict Self-control and Impulsivity

Before the regressions described in this research were conducted, preliminary analyses were conducted to assess any violations of the assumptions of normality, linearity, multicollinearity and homoscedasticity. No problematic violations of these assumptions were noted. After reviewing reporting methods in Fetterman et al.'s research, it was decided that standardized beta coefficients should be reported for regression analyses. In keeping with the previous research bootstrap analyses were used to test the significance of mediation.

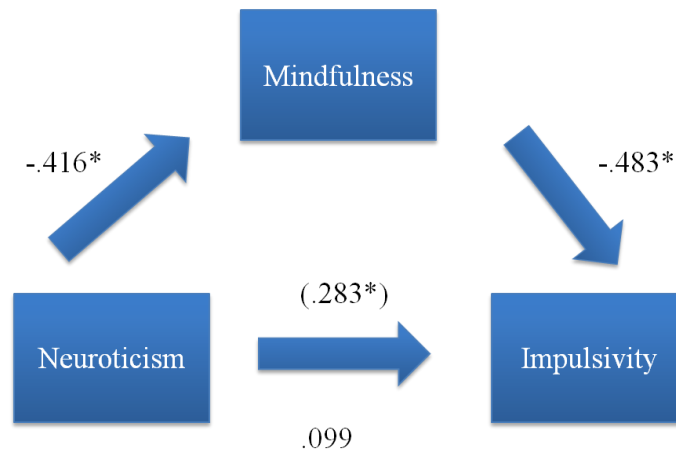
Bootstrapping is the preferred method for testing the significance of mediation over the Sobel test, because the Sobel test tends to provide skewed results (Preacher & Hayes, 2008). Though the previous authors were not explicit in declaring which type of beta coefficients they reported (standardized or unstandardized) and could not be contacted for direct inquiry about their reporting practices, this decision was based on apparent reporting practices in the previous authors' research after reviewing their results with a statistician.

Multiple Regressions: Impulsivity

Analytical procedures used in Fetterman et al.'s research were followed to test replication of the predicted role of mindfulness as a mediator of the neuroticism-impulsivity relationship in a new sample. In simple regressions, neuroticism was a negative predictor of mindfulness $Beta = -.416, p < .001$, and a positive predictor of impulsivity, $Beta = .283, p < .001$. Higher levels of mindfulness were associated with lower levels of impulsivity $Beta = -.483, p < .001$. To determine whether mindfulness mediated the neuroticism-impulsivity relationship in the current sample, a multiple regression was run in which neuroticism and mindfulness were evaluated as simultaneous predictors of impulsivity (Baron & Kenny, 1986). In this multiple regression,

mindfulness remained a significant predictor, $Beta = -.443, p < .001$, but neuroticism was no longer a significant predictor $Beta = .099, p = .107$ (see fig. 2). These outcomes replicate the previous findings that mindfulness fully mediated the neuroticism-impulsivity relationship. Bootstrapping analyses were used to confirm that the mediation effect was significant (bootstrap mean = .2562; 95% CI varying from .1608 to .3851, $p < .05$) (Preacher & Hayes, 2008).

2: Mediation Model of Neuroticism and Mindfulness as Predictors of Impulsivity. Standardized betas for direct paths are reported above the relevant arrow (also in parenthesis for path C). Standardized betas for indirect paths are reported below the relevant arrow. * $p < .001$. In the current data, C' path: $p > .05$ (non-significant).



In addition, neuroticism and mindfulness were evaluated as predictors of impulsivity in the sample of participants that indicated they practice mindfulness more than once a week ($n = 24$). In simple regressions, neither neuroticism, $Beta = .411, p = .072$, nor mindfulness $Beta = -.347, p = .134$, significantly predicted impulsivity in the sample of individuals who indicated they practice mindfulness more than once a week. The results suggest the possibility that neuroticism and mindfulness may not be as predictive of impulsivity in those who practice mindfulness frequently. This possibility could be an interesting exploration for future research.

The sample was then split by sex. Among females, mindfulness was a significant mediator of the neuroticism-impulsivity relationship, $Beta = -.366, p < .001$ (bootstrap mean = .1880; 95% CI varying from .1051 to .2965, $p < .05$), providing further evidence of this effect in females. Unlike in Fetterman et al.'s analysis, mindfulness was also a significant mediator of the neuroticism-impulsivity relationship among males, $Beta = -.577, p < .001$ (bootstrap mean = .4665; 95% CI varying from .1692 to .8914, $p < .05$). Though the previous research pointed to a small male sample as a potential explanation for the lack of significance in their findings for males, there was still an effect of mindfulness on the neuroticism-impulsivity relationship in their outcomes for males. The current study strengthens evidence of this effect in males.

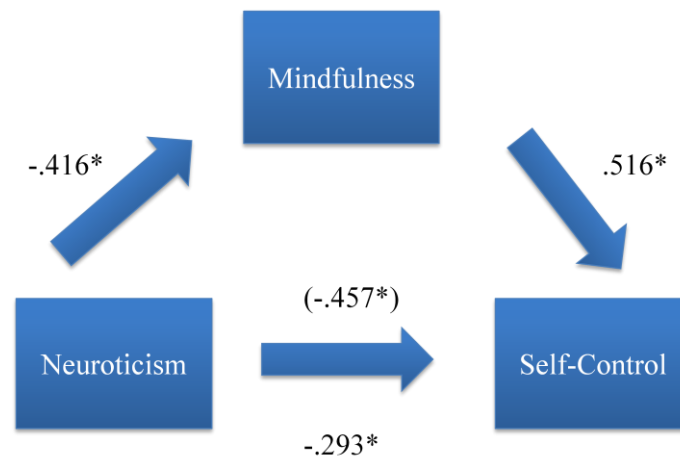
Further, the exploration of impulsivity as a mediator of the neuroticism-mindfulness relationship was replicated in an alternative mediation model. When neuroticism and impulsivity were simultaneously entered as predictors of mindfulness, both neuroticism, $Beta = -.303, p < .001$, and impulsivity, $Beta = -.397, p < .001$, remained significant predictors, which replicates Fetterman et al.'s findings and reinforces the assertion that mindfulness mediates the neuroticism-impulsivity relationship.

Multiple Regressions: Self-control

In simple regressions, neuroticism was a negative predictor of mindfulness, $Beta = -.416, p < .001$, and self-control $Beta = -.457, p < .001$. Mindfulness was a positive predictor of self-control, $Beta = .516, p < .001$. Subsequently neuroticism and mindfulness were simultaneously entered as predictors of self-control. The results here partly diverge from previous findings in Fetterman et al.'s research. In both the previous research and the current findings, mindfulness remained a significant predictor of self-control, $Beta = .394, p < .001$; however unlike in the

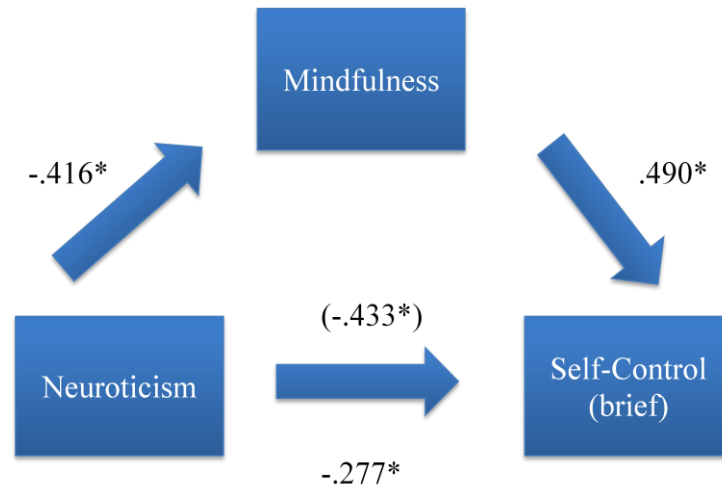
previous research, neuroticism also remained a significant predictor, $Beta = -.293, p < .001$, suggesting that in the current sample mindfulness partially rather than fully mediates the relationship between neuroticism and self-control (bootstrap mean = $-.0128$; 95% CI varying from $-.0181$ to $-.0084, p < .05$) (see fig. 3).

3: Mediation Model of Neuroticism and Mindfulness as Predictors of Self-control (full Self-Control Scale). Standardized betas for direct paths are reported above the relevant arrow (also in parenthesis for path C). Standardized betas for indirect paths are reported below the relevant arrow.* $p < .001$



For the purpose of an exact comparison between current and previous findings, the same mediation analysis was run using the brief SCS, which was the version of the SCS used in the previous research. Neuroticism and mindfulness were simultaneously evaluated as predictors of overall score on the brief Self-Control Scale. Once again mindfulness remained a significant predictor, $Beta = .375, p < .001$; and unlike in the previous research, neuroticism continued to remain a significant predictor, $Beta = -.277, p < .001$, suggesting that in the current sample mindfulness partially rather than fully mediates the relationship between neuroticism and (brief) self-control (bootstrap mean = $-.0151$; 95% CI varying from $-.0214$ to $-.0100, p < .05$) (see fig. 4).

4: Mediation Model of Neuroticism and Mindfulness as Predictors of Self-control (brief Self-Control Scale). Standardized betas for direct paths are reported above the relevant arrow (also in parenthesis for path C). Standardized betas for indirect paths are reported below the relevant arrow. * $p < .001$



In addition, neuroticism and mindfulness were evaluated as predictors of self-control in the sample of participants that indicated they practice mindfulness more than once a week ($n = 24$). In simple regressions, both neuroticism, $Beta = -.745, p < .001$, and mindfulness, $Beta = .613, p = .004$, significantly predicted self-control in this sample. Subsequently in a multiple regression in which neuroticism and mindfulness were simultaneously evaluated as predictors of self-control, neuroticism, $Beta = -.533, p = .004$, and mindfulness, $Beta = .412, p = .021$, both remained significant predictors of self-control in this sample. Because neuroticism's beta coefficient as a predictor of self-control is larger than that of mindfulness in both simple and multiple regressions, this suggests that mindfulness may not be a mediator of the neuroticism-self-control relationship in the sample of individuals who reported practicing mindfulness more than once a week.

Finally, splitting the sample by sex revealed that mindfulness partially mediated relations between neuroticism and (brief) self-control among both females, $Beta = .342, p < .001$

(bootstrap mean = -.0116; 95% CI varying from -.0184 to -.0065, $p < .05$) and males, Beta = .500, $p < .001$ (bootstrap mean = -.0233; 95% CI varying from -.0396 to -.0125, $p < .05$).

In light of the divergence in results from previous work, an exploration of an alternative mediation model examining whether self-control would be equally effective in mediating neuroticism-mindfulness relationship was conducted. A multiple regression predicting mindfulness by simultaneously entering neuroticism and self-control revealed both neuroticism, Beta = -.227, $p < .001$, and self-control (full SCS), Beta = .412, $p < .001$, remained significant predictors, which is in line with previous findings. As expected, the same analysis using the brief SCS also revealed that neuroticism Beta = -.246, $p < .001$, and self-control (bSCS), Beta = .404, $p < .001$, remained significant predictors of mindfulness. The conclusion from similar findings in Fetterman et al.'s work was that mindfulness fully mediated relationship between neuroticism and self-control, and that a different ordering among variables was not more successful than ordering mindfulness as a mediator of the neuroticism-self-control relationship. While the results in the current study for the alternative model provide further support for that conclusion, the main model suggests mindfulness partially mediates the neuroticism-self-control relationship, but that neuroticism still remains a significant predictor of self-control even in the presence of mindfulness.

CHAPTER 4: DISCUSSION

Summary of Findings

On the basis of previous research exploring mindfulness as a mediator between 1) neuroticism and impulsivity and 2) neuroticism and self-control (Fetterman et al., 2010), the current study sought to replicate previous findings by testing the hypotheses in a new sample.

The hypotheses were: a) neuroticism is an inverse predictor of mindfulness; b) higher levels of mindfulness are associated with lower levels of impulsivity; c) higher levels of mindfulness are associated with higher levels of self-control; and d) mindfulness mediates the neuroticism-self-control and neuroticism-impulsivity relationships. The majority of these hypotheses were fully supported by the current results, with an exception for hypothesis d. In the neuroticism-self-control relationship, mindfulness was a partial rather than full mediator in the current sample. Potential explanations for this finding in the current results are explored in this discussion. However, in the current sample mindfulness remained a full mediator of the neuroticism-impulsivity relationship, replicating findings from the previous study. These results reinforce previous findings indicating the importance of mindfulness in understanding neuroticism's behavioral correlates.

Mindfulness Fully Mediates the Neuroticism-impulsivity Relationship

Mindfulness was inversely associated with neuroticism, suggesting that increased attention and awareness in the present moment are inversely associated with negative affect. Our findings were similar to those in Fetterman et al.'s research. Neuroticism was associated with and predictive of higher overall impulsivity, suggesting that increased predisposition to negative affect is positively associated with impulsiveness. Among the BIS subscales (attentional, motor, and nonplanning impulsiveness), neuroticism was most positively correlated with attentional impulsiveness, though all three correlations were significant. These current findings suggest that neuroticism may be associated with increased attentional impulsiveness in particular, as well as increased motor and nonplanning impulsiveness.

Mindfulness was inversely associated with overall impulsivity, suggesting that increased attention and awareness in the present moment is negatively associated with impulsiveness. Among the BIS subscales mindfulness was most negatively correlated with attentional impulsiveness, though all three subscale correlations were significant. These findings suggest that mindfulness may be associated with increased attention and intentional motor actions, and decreased nonplanning.

When mindfulness and neuroticism were evaluated simultaneously as predictors of impulsiveness, only mindfulness remained a significant predictor, suggesting mindfulness fully mediates the neuroticism-impulsivity relationship. This replicates previous findings and strengthens the evidence that when mindfulness is present neuroticism no longer significantly predicts increased impulsiveness. This finding suggests introducing and enhancing mindfulness may counteract the behavioral dysregulation correlates of neuroticism.

Mindfulness Partially Mediates the Neuroticism-self-control Relationship

Neuroticism was associated with and predictive of lower self-control, suggesting that increased predisposition to negative affect is negatively associated with self-control. Mindfulness was associated with and predictive of higher self-control, suggesting that increased attention and awareness in the present moment is positively associated with self-control.

When mindfulness and neuroticism were simultaneously evaluated as predictors of self-control, both remained significant predictors. However, neuroticism became a weaker predictor of self-control when mindfulness was included in the analysis, suggesting that mindfulness partially mediates the neuroticism-self-control relationship. This result closely but does not fully replicate the previous findings in which mindfulness was a full mediator of the neuroticism-self-

control relationship (Fetterman et al., 2010). The previous findings suggest that when mindfulness is present neuroticism is no longer a significant predictor of self-control, but the current findings suggest that mindfulness weakens rather than eliminates neuroticism as a significant predictor of self-control.

Interestingly, in the group of participants who reported practicing mindfulness more than once a week, both neuroticism and mindfulness were significant predictors of self-control. Mindfulness did not appear to be a mediator of the neuroticism-self-control relationship in the sample of individuals who reported practicing mindfulness more than once a week. Future research should explore whether this finding bears out in a larger sample of those who practice more than once a week.

Comparing Mindfulness as a Mediator in the Previous and Current Research

There may be a number of explanations when considering why mindfulness partially rather than fully mediated the neuroticism-self-control relationship in the current sample. It is speculated here that the partial mediation found in this study may point to the distinction between mindfulness as a monitoring mechanism with no inherent goals or action tendencies and self-control as a construct *defined* by goal-oriented action tendencies.

Mindfulness in the MAAS is defined as “dispositional open or receptive awareness of and attention to what is happening in the present” (Brown & Ryan, 2003), while self-control in the SCS is defined as “the ability to override or change one’s inner responses, as well as to interrupt undesired behavioral tendencies (such as impulses) and refrain from acting on them” (Tangney, Baumeister & Boone, 2004). Thus, while mindfulness emphasizes *supervision* of inner experiences and overt behaviors, self-control emphasizes *altering* inner experience and

overt behaviors, with the idea that effortful control is useful for “breaking habits, resisting temptation, and keeping good self-discipline.” It should be noted that supervision and awareness of behaviors is a key step that precedes regulating them, so one might argue that awareness as represented in mindfulness is a preliminary step for self-control, but that awareness does not automatically lead to altering behavior. To expand on this notion, it could be that self-control in the presence of mindfulness manifests in an optimal balance along a spectrum ranging on one end from utter lack of self-control (potentially as represented by the BIS) to the other end where self-control is elevated to the point of rigidity (this might be considered a paradox: compulsive self-control). Mindfulness facilitates awareness, equanimity, and non-reactivity to negative stimuli, which reduces reactive, short-sighted attempts to address discomfort that may be detrimental to one’s desired outcomes or goals for the self; at the same time, mindfulness, which is rooted in awareness and acceptance, precludes rigid self-control that might otherwise spring from frantic attempts to “fix” or “get rid of” negative stimuli. If this is in fact the case, this might explain why negative affect remains a significant predictor of self-control in the presence of mindfulness, but to a lesser degree than when mindfulness is absent. In other words, mindfulness may foster self-control, while also permitting a degree of human reaction to stimuli. These possibilities present nuances to be explored more deeply in future research. Meanwhile, mindfulness, which fosters awareness and non-reactivity, is counter to the inherent reactivity in impulsivity. It is possible that such an understanding of the dynamics between mindfulness, self-control, and impulsivity explains the divergent results between the neuroticism-impulsivity and neuroticism-self-control relationships when introducing mindfulness as a mediator.

Impulsiveness in the current study is defined as “a predisposition toward rapid, unplanned reactions to internal or external stimuli without regard to the negative consequences

of these reactions to the impulsive individuals or to others,” (Stanford et al., 2009). Thus, in the BIS one might consider impulsiveness an *absence* of supervision of inner responses and overt behaviors or their consequences. If self-control is an ability to override unwanted thoughts or behaviors, while impulsiveness is reactive behavior in the absence of monitoring, the dynamic of each construct’s relationship to mindfulness is distinct. Mindfulness may work to foster self-control and counteract impulsiveness but also permit acceptance of present experience. It should be noted that the overall correlation between SCS and BIS in the current sample, $r = -.752$ ($p < .001$, $n = 245$), suggests that conceptually the constructs of self-control and impulsiveness are closely related but may not be exact opposites. Perhaps mindfulness more consistently predicts one’s tendency to have (diminished) reactive thoughts and behaviors, but less consistently predicts one’s tendency to control thoughts and behaviors. However, the fact that in the previous research mindfulness was a full mediator of the neuroticism-self-control relationship leaves room to consider other possible explanations as well that are considered in the following paragraphs.

Although methods for analyzing the neuroticism-self-control relationship were replicated from Fetterman et al.’s research, it is also possible that confounds are influencing the neuroticism-self-control relationship in such a way that mindfulness is a partial rather than full mediator in the current sample. The possibility was considered that the current sample may differ from the previous researchers’ sample on mean score on mindfulness, self-control, and/or neuroticism. In the current sample, mean scores and standard deviations for each of the questionnaires were as follow: neuroticism (response $M = 2.56$; $SD = .77$), mindfulness ($M = 3.91$; $SD = .79$), and self-control ($M = 3.36$; $SD = .56$). In Fetterman et al.’s cumulative study in which all four variables were considered (study 3), mean scores and standard deviations were as follow: neuroticism ($M = 2.74$; $SD = .89$), mindfulness ($M = 3.89$; $SD = .82$) and self-control (M

= 3.29; $SD = .48$). The means and standard deviations for the variables included in the self-control mediation analysis are nearly the same between the previous study and the current study, so a drastic difference in the sample in terms of these variables does not seem a likely explanation for the partial mediation revealed in the current study. The only demographic data provided by the previous research was gender, and that was collected for two of the three studies leading to Fetterman et al.'s proposed cognitive mediation model, so demographic differences between the previous and current study were difficult to compare. However, the previous authors pointed to a lack of variation in the variables between genders as a justification for ceasing to collect gender data. It should also be noted that the current study collected data from the general population beyond college students in an effort to increase generalizability of results. There could be a distinguishing factor between college students and the general population that is producing the partial mediation found in the current study. One suggestion for future research is to replicate this study in a general population to see whether the partial mediation found in the current research bears out again, and also consider what other variables should be accounted for to help understand any possible differences in the findings across studies examining these relationships.

When considering the innumerable behaviors and decisions influenced by negative affect to produce thoughts and actions that may or may not be in the best interest of one's goals for the self, it becomes clear that the finding that mindfulness partially mediates the neuroticism-self-control relationship may have important clinical implications for counteracting the behavioral dysregulation correlates of neuroticism. At the same time, the inconsistency in the previous and current findings for mindfulness as a full or partial mediator of the neuroticism-self-control relationship opens the field to explore the mindfulness-self-control relationship more deeply to

determine whether perhaps mindfulness has some influence over self-control, with its influence varying depending on factors that have perhaps not been accounted for in the current study. This needs to be explored further in future research as well as clinically. Interestingly, neither neuroticism nor mindfulness were significant predictors of impulsivity in the participants that indicated they practice mindfulness more than once a week ($n = 24$). The results suggest the possibility that neuroticism and mindfulness may not be as predictive of impulsivity in those who practice mindfulness frequently, though due to the small sample size, generalizability of these results is limited. It would be useful to explore whether these results bear out in a larger sample of those who maintain a mindfulness practice more than once a week.

Demographic Factors in Mindfulness

There was no significant difference in mindfulness based on race and ethnicity, gender, or education, which suggests that mindfulness may be little affected by these demographic variables. Higher mindfulness was positively correlated with increased age, but only modestly. Prior exposure to and current practice of mindfulness had little effect on average mindfulness score. One possible explanation for this finding is that of those who had prior exposure ($n=107$) only about half indicated they currently practice ($n = 55$), so there may not have been a big enough difference between the “no prior exposure” and “prior exposure” groups to detect a difference in mean mindfulness score. MacKillop and Anderson (2007) had similar results when comparing mindfulness based on experience in a large college student sample ($n = 727$). In their cohort, 10% of participants reported experience with meditation, and there was no significant difference in mindfulness on the MAAS between participants with meditation experience and those without. MacKillop and Anderson suggest that perhaps the lack in difference may be due

to the level of participants' mediation experience in the study, many of them being novices (the modal response being one year of experience or less). They concluded there may be no obvious differences in mindfulness between novice practitioners and those who have not meditated previously. While the current study did not collect data on number of years of experience with meditation (if applicable), it did collect data on mindfulness practice frequency. Only 24 individuals indicated maintaining a practice more than once a week, which also suggests that those who did have a current practice may not be practicing enough to create a sizeable difference in their level of mindfulness as compared to an individual without a current practice. It is also speculated that those who practice mindfulness may be more aware of lapses in mindfulness, and may therefore report lower mindfulness in spite of increased practice.

Among those participants who indicated they currently practice mindfulness techniques, there was not a significant difference in mean score in mindfulness based on frequency of practice. Again, this may have been due to the small number of participants who indicated they currently practice, and the subgroups based on practice frequency, which were even smaller, ranged in size from 4 to 24 participants.

Limitations and Future Directions

There were several limitations in the current study. The cross-sectional design precludes determining causality in results interpretation. In addition, data was collected via self-report, which opens the results to recall bias. Participants self-selected to respond to the questionnaire, so volunteer bias is also a limitation. In addition the current study did not control for type of mindfulness practice (if applicable) for those who endorsed a current practice. For example, mindfulness may be cultivated with mindfulness meditation, yoga, as well as in everyday

activities such as walking and eating. It is possible that these various modes of mindfulness may have subtle distinctions in mechanisms and outcomes, and this is an important aspect of mindfulness to explore in future research. In future research further exploration of the association between mindfulness and self-control as well as self-control and neuroticism and impulsivity is needed. It would be interesting to explore and cross-validate any potential consistency in the associations among these constructs using neurological, behavioral, and self-report assessment. This research would benefit from a follow-up study assessing the same measures via task performance to see whether the self-report results carry over into directly observed behavioral associations and outcomes. One intriguing direction forward among many possibilities is to explore an expanded model of the current associations as applied to health behaviors influenced by negative affect such as sleep, food choices, binge eating, substance use, etc. (Baumeister & Vohs, 2004; Martin, Williams, Haskard & DiMatteo, 2012).

Conclusion

The present results suggest mindfulness may have a role in minimizing, if not eliminating, the effects of neuroticism on self-control. Such effects should be evaluated further to compare factors contributing to the partial mediation in the current study with the full mediation found the previous study. In addition, previous findings by Fetterman et al. and present results suggest mindfulness may have a role in eliminating the effects of neuroticism on impulsivity. These findings may have important implications for behaviors subject to the influences of negative affect, impulsivity, and self-control. Future research should evaluate the implications of the current findings for specific behaviors that have been found to be detrimentally influenced by negative affect. Since mindfulness is relatively low-cost and easy to learn, it may be a useful tool

for enhancing self-regulation and intervening with negative affect's influences on behavioral dysregulation. As Brown, Ryan, and Creswell (2007) suggest, "The investigation of mindfulness can help to widen our window into the nature of consciousness, its fundamental role in human functioning, and how it can be refined to optimize that functioning." A continuation of research exploring mindfulness as a self-regulation tool in the future would be useful for such purposes.

Appendix A: Demographics Questionnaire

Do you smoke? (check one)

- Yes
- No

What is your date of birth? (fill in the blank)

What is your race? (check all that apply)

- Caucasian
- Black/African American
- American Indian/Alaska Native
- Hawaiian Native/Pacific Islander
- Hispanic/Latino/a
- Other

What is your gender? (check one)

- Male
- Female

What is the highest level of education you have completed? (check one)

- Not a high school graduate
- High school diploma or GED
- Some college or associate's degree
- Bachelor's degree
- Some graduate coursework
- Advanced degree

One definition of mindfulness is “open and receptive attention and awareness to the present moment” (Brown & Ryan, 2003). Have you had previous exposure to mindfulness training (for example, mindfulness meditation)? (check one)

- Yes
- No
 - If yes, do you practice mindfulness now? (check one)
 - Yes
 - No
 - If yes, how regularly do you practice? (check one)
 - More than once a week
 - Once a week
 - 2 to 3 times a month
 - Once a month
 - Less than once a month

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