Mindfulness-Based Attention as a Moderator of the Relationship Between ADHD and Comorbid Disorders

Alana Jacobs

Pacific University
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Abstract
ADHD continues to be a problem affecting not only those with the disorder themselves but also the people they interact with and are close to, as well as society as a whole. Although some treatment options exist, a large percentage of individuals with ADHD remain untreated and many of those who do obtain treatment continue to struggle with the disorder. Those with ADHD and one or more co-occurring psychological disorders are particularly in need of alternative treatment options. To inform the development of alternative treatment options particularly for this population, further research on the relationship between ADHD and frequently co-occurring psychological disorders is critical. A number of studies have suggested that ADHD is predictive of depression, anxiety, and alcohol abuse. Studies examining these relationships have not largely focused on the possible presence of a moderating variable. Mindfulness may be conceptually related to these risk factors, as many of the impairments involved in ADHD are shown to improve in association with mindfulness practice, and mindfulness-based interventions have been found to reduce symptoms of depression, anxiety, and alcohol abuse. Few studies however have examined how mindfulness might be related to ADHD. The aim of this thesis was to investigate the relationship between ADHD and the following factors: (1) depression, (2) anxiety, (3) alcohol abuse, and (4) mindfulness. As expected, a significant positive relationship was found between ADHD and depression. Also, as expected, significant negative relationships were found between mindfulness and ADHD, mindfulness and depression, and mindfulness and anxiety. Contrary to expectations, a significant relationship was not found between ADHD and anxiety or between ADHD and alcohol consumption. Further, contrary to expectations, level of mindfulness did not significantly moderate the relationship between ADHD and depression, ADHD and anxiety, or ADHD and alcohol consumption. Thus, the present study’s findings did not support the hypothesis that having a disposition towards mindfulness serves as protective factor when it comes to the relationship between ADHD and depression, anxiety, and alcohol consumption. The implications and limitations of these findings, as well as recommendations for future research are discussed.

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MINDFULNESS-BASED ATTENTION AS A MODERATOR OF THE RELATIONSHIP BETWEEN ADHD AND COMORBID DISORDERS

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Michael S. Christopher, Ph.D
Abstract

ADHD continues to be a problem affecting not only those with the disorder themselves but also the people they interact with and are close to, as well as society as a whole. Although some treatment options exist, a large percentage of individuals with ADHD remain untreated and many of those who do obtain treatment continue to struggle with the disorder. Those with ADHD and one or more co-occurring psychological disorders are particularly in need of alternative treatment options. To inform the development of alternative treatment options particularly for this population, further research on the relationship between ADHD and frequently co-occurring psychological disorders is critical. A number of studies have suggested that ADHD is predictive of depression, anxiety, and alcohol abuse. Studies examining these relationships have not largely focused on the possible presence of a moderating variable. Mindfulness may be conceptually related to these risk factors, as many of the impairments involved in ADHD are shown to improve in association with mindfulness practice, and mindfulness-based interventions have been found to reduce symptoms of depression, anxiety, and alcohol abuse. Few studies however have examined how mindfulness might be related to ADHD. The aim of this thesis was to investigate the relationship between ADHD and the following factors: (1) depression, (2) anxiety, (3) alcohol abuse, and (4) mindfulness. As expected, a significant positive relationship was found between ADHD and depression. Also, as expected, significant negative relationships were found between mindfulness and ADHD, mindfulness and depression, and mindfulness and anxiety. Contrary to expectations, a significant relationship was not found between ADHD and anxiety or between ADHD and alcohol consumption. Further, contrary to expectations, level of mindfulness did not significantly moderate the relationship between ADHD and depression, ADHD and anxiety, or ADHD and alcohol consumption. Thus, the present study’s findings did
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Keywords: Mindfulness, ADHD, depression, anxiety, and alcohol consumption.

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INTRODUCTION ...........................................................................................................................1

REVIEW OF LITERATURE ..........................................................................................................4

Clinical Picture of ADHD............................................................................................................4

ADHD, Predominately Inattentive Type .............................................................................5

ADHD, Predominately Hyperactive-Impulsive Type..........................................................5

Symptom Presentation into Adulthood ...............................................................................6

Prevalence Rates .........................................................................................................................7

Etiology .......................................................................................................................................7

Diagnostic/Special Considerations .............................................................................................9

Impairment ................................................................................................................................10

Cognitive ................................................................................................................................10

Academic ..........................................................................................................................11

Workforce ..........................................................................................................................11

Interpersonal/Family .........................................................................................................12

Societal Impact ..................................................................................................................13

ADHD & Psychological Functioning .......................................................................................14

Depression .........................................................................................................................15

Anxiety ..............................................................................................................................16

Alcohol Abuse ..................................................................................................................18

Low Treatment Rates for Adult ADHD .................................................................19
Current Treatments for ADHD .................................................................19

Medications ........................................................................................................19

Psychosocial Interventions ....................................................................................22

Mindfulness ........................................................................................................25

Definition ...........................................................................................................25

Background .........................................................................................................25

Concentration Meditation vs. Mindfulness .......................................................27

Mechanisms of Change .....................................................................................28

Exposure .............................................................................................................28

Cognitive Change .............................................................................................28

Self-management ..............................................................................................29

Acceptance .......................................................................................................30

Mindfulness-Based Therapies & Outcomes ....................................................30

Mindfulness-Based Stress Reduction .............................................................30

Mindfulness-Based Cognitive Therapy ..........................................................31

Acceptance and Commitment Therapy .........................................................32

Dialectical Behavior Therapy .........................................................................33

Overall Effect Size ............................................................................................33

Mindfulness & Alcohol/Substance Use ...........................................................34

Further Mindfulness Findings & Connection to ADHD .............................35

Attention & The Brain .....................................................................................36

Behavioral & Affective Control/Impulsivity ..................................................37

Self Regulation ..................................................................................................39
Table 1: Demographics
Table 2: Means, Standard Deviations, Skewness, and Kurtosis by Variable
Table 3: Intercorrelations Between Variables
Table 4: Regression Analysis Predicting Depression from ADHD & Mindfulness
Table 5: Regression Analysis Predicting Anxiety from ADHD & Mindfulness
Table 6: Regression Analysis Predicting Alcohol Consumption from ADHD & Mindfulness
Introduction

Current pharmaceutical and therapeutic treatment options for Attention-Deficit Hyperactivity Disorder (ADHD) are not meeting the needs of a substantial segment of individuals with ADHD, leaving many to struggle with symptoms and face significant functional impairments. It is critical to develop efficacious alternative treatments for ADHD that target not only primary symptoms, but also associated impairments and symptoms associated with comorbid disorders that may be present. Those with ADHD and one or more comorbid disorders are often the hardest to treat and most affected in their functioning, thus this group is in particular need of efficacious alternative treatments. However, such treatments cannot be developed without first understanding the relationship between ADHD and common comorbidities.

Increasing evidence indicates that ADHD, once thought to primarily affect children, persists into adulthood in at least 50% of individuals (Barkley, 1998; Barkley, Fischer, Smallish, & Fletcher, 2002; Wilens & Dodson, 2004). Poor academic performance, difficulties in the workplace, and social impairments are examples of the plethora of additional problems frequently associated with ADHD, and of particular interest is the increased rates of comorbid disorders including anxiety, depression, and alcohol abuse (Biederman, 2004; Gilberg et al., 2004; Kessler et al., 2006; Kollins, 2008; Wilens & Dodson, 2004; Zylowska et al., 2008). Individuals with ADHD and comorbid psychological disorders are more impaired in their functioning and have a poorer long-term prognosis than individuals with a sole diagnosis of ADHD (Bauermeister et al., 2007; Biederman et al., 1996; Connor et al., 2003; Gilberg et al., 2004). Currently stimulant medications are the gold standard treatment for ADHD across the lifespan, however 50% of adults are non-responders (Dodson, 2005; Shekim, Asarnow, Hess, Zaucha, & Wheeler, 1990; Wender, 1998; Zylowska, Smalley, & Schwartz, 2009). It is
imperative that ADHD be better understood in order to inform much needed research on alternative treatments, with particular attention paid to individuals with comorbidities, as this population is often the most complex to treat.

Mindfulness based attention may serve as an important protective factor between ADHD and comorbid disorders. The explosion of research on mindfulness seen in the West, specifically examining the effects of mindfulness training on numerous psychological and medical concerns, has surprisingly paid relatively little attention to ADHD. Nevertheless, numerous impairments associated with ADHD have demonstrated improvement in those with increased mindfulness-based attention or those who have participated in a mindfulness-training program (Brown & Ryan, 2003; Creswell, Eisenberger, & Liberman, 2008; Jha, Kiyonaga, Woong, & Gelfand, 2010; Raz & Buhle, 2006; Tang et al., 2007; Wenk-Sormaz, 2005; Zylowska et al., 2006). For example, mindfulness-based attention has been found to be associated with increases in attention regulation (Jha, Krompinger, & Baime, 2007) and decreases in impulsivity (Roemer & Orsillo, 2003; Segall, 2005), thus reflecting improvements in the two primary symptoms of ADHD. In addition, increased mindfulness-based attention is associated with decreases in many disorders that are frequently comorbid with ADHD such as depression (Shapiro, Schwartz, & Bonner, 1998; Teasdale et al., 2000), anxiety (Greeson & Brantley, 2008; Hayes, Strosahl, & Wilson, 1999; Kabat-Zinn et al., 1992; Roemer, Orsillo, Salter-Pedneault, 2008), and substance abuse (Marlatt et al., 2004). Although there is minimal research directly examining the relationship between mindfulness and ADHD, there is evidence suggesting that individuals with ADHD are lower in trait mindfulness (Smalley, Loo, Hale, Shreshta, & McGough, 2009). Further, a few preliminary studies examining the effects of participation in mindfulness-based interventions on individuals with ADHD (mostly children), suggest practice in cultivating increased mindfulness
improves primary symptoms of ADHD (Harrison, Manocha, & Rubia, 2004, Zylowska et al., 2008), enhances executive function (Grosswald, Stixrud, Travis, & Bateh, 2008), and serves to reduce symptoms of anxiety and depression (Grosswald, Stixrud, Travis, & Bateh, 2008; Zylowska et al., 2008). Primary improvements may be understood by considering that a fundamental aspect of mindfulness is the present awareness of one’s attention, believed to be critical to the self-regulation process, and ADHD often involves deficits in attention and subsequent difficulties in self-regulation (Smalley et al., 2009; Zylowska et al., 2009). Thus mindfulness-based treatments may address key components of the ADHD clinical picture.

There is a critical need for research focused on better understanding individuals with ADHD and comorbidities in order to inform the development of efficacious interventions for this underserved population who are most unresponsive to current treatment options and face the most impairment (Newcorn, 2008; Stein, 2008; Wilens, Spencer, & Biederman, 2000). Mindfulness based treatments may be effective in treating this population, however research is needed to determine if this is so. Thus, by examining whether mindfulness-based attention moderates the relationship between ADHD and negative outcomes, it is hoped that this will provide further impetus for the development and utilization of mindfulness-based treatments for individuals facing not only ADHD, but also comorbid symptoms.
Review of the Literature

Clinical picture of ADHD

At one time in history what is today known as Attention Deficit Hyperactivity Disorder (ADHD) was associated with terms such as “minimal brain dysfunction” and “minimal brain damage” (Adler, 2008; Dodson, 2005). Although clinical descriptions closely resembling the current ADHD diagnostic criteria are cited as far back as 1902, it was not until 1987 that a full adult diagnosis of ADHD was added to the Diagnostic and Statistical Manual of Mental Disorder, 3rd ed. (DSM-III-R; American Psychiatric Association [APA], 1987).

ADHD is classified in the DSM-IV-TR as symptoms of either inattention or hyperactivity-impulsivity that have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental levels. According to the DSM-IV-TR, to meet criteria for ADHD some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years old, some impairment from the symptoms is present in two or more settings, and there must be clear evidence of clinically significant impairment in social, academic, or occupational functioning. In addition, the DSM-IV-TR states that the symptoms of ADHD must not occur exclusively during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder and are not better accounted for by another mental disorder (APA, 2000).

In the DSM-IV-TR, ADHD is classified into 3 types, 1) Combined Type 2) Predominately Inattention Type and 3) Predominately Hyperactive-Impulsive Type. Individuals diagnosed with ADHD, Combined Type have symptoms that meet full criteria for both the inattention and hyperactivity-impulsivity groups. A diagnosis of ADHD, Predominately
Hyperactive-Impulsive Type reflects symptoms that only meet criteria for the hyperactivity-impulsivity group (APA, 2000).

**Attention-Deficit/Hyperactivity Disorder, Predominately Inattentive Type.** In the DSM-IV-TR a diagnosis of ADHD, predominately inattentive type signifies that a person has 6 or more symptoms of inattention that have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level. Symptoms of inattention include 1) often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities 2) often has difficulty sustaining attention in tasks or play activities 3) often does not seem to listen when spoken to directly 3) often does not follow through on instructions and fails to finish school work, chores, or duties in the workplace (not due to oppositional behavior failure to understand instructions) 4) often has difficulty organizing tasks and activities 5) often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework) 6) often loses things necessary for tasks or activities (e.g., toys, school assignments, pencils, books, or tools) 7) is often easily distracted by extraneous stimuli and 8) is often forgetful in daily activities (APA, 2000).

**Attention-Deficit/Hyperactivity Disorder, Predominately Hyperactive-Impulsive Type.** According to the DSM-IV-TR, to meet criteria for ADHD, hyperactivity-impulsive type an individual must have 6 or more of the following symptoms of either hyperactivity or impulsivity that have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental levels. Symptoms of hyperactivity include a) often fidgets with hands or feet or squirms in seat b) often leaves seat in classroom or in other situations in which remaining seated is expected c) often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness d)
often has difficulty playing or engaging in leisure activities quietly e) is often "on the go" or often acts as if "driven by a motor" and f) often talks excessively. Symptoms of impulsivity include a) often blurts out answers before questions have been completed b) often has difficulty awaiting turn and c) and often interrupts or intrudes on others (e.g., butts into conversations or games) (APA, 2000).

**Symptom Presentation into Adulthood.** It is important to note that symptoms change over the course of a patient’s lifetime and the symptoms in the DSM-IV-TR are specific to childhood. Symptoms of hyperactivity and impulsivity decline more rapidly with age than do symptoms of inattention. Thus, symptoms of hyperactivity-impulsivity are not as commonly expressed in adults (Wilens, Faraone, & Biederman, 2004). The symptoms of inattention delineated in the DSM-IV-TR often manifest in adults as poor time management, trouble initiating and completing tasks, trouble with multitasking, procrastination, and avoiding activities that demand attention (Hechtman, & Weiss, 1999; Weiss, Trokenberg,). The symptoms of hyperactivity listed in the DSM-IV-TR, which pertain to children and embody an aimless restlessness, often present in adults as purposeful restlessness. Purposeful restlessness is characterized by an experience of inner restlessness that is channeled in various productive ways such as working two jobs, choosing an active profession, or becoming involved in various activities (Adler, 2008). Overall symptoms of inattention and hyperactivity-impulsivity tend to manifest more subtly in adults compared to children. However, in contrast to childhood ADHD in which there is only a modest correlation between symptoms and impairment, impairment may actually increase in adults (DSM-IV-III, 1980; Stein, 2008). A combination of less daily structure, an increase in cognitive load, and the cumulative effect of untreated or undertreated
ADHD symptoms all may play a role in increasing impairments with age (Adler, 2008; Stein, 2008).

**Prevalence Rates**

Adult ADHD has an estimated prevalence rate of 4.4% in the United States, thus affecting more than 9 million Americans (Kessler et al., 2006). An epidemiologic study investigating populations in 10 countries, including the United States, found an average prevalence rate of 3.4% for childhood onset persistent ADHD in adults (Fayyad et al., 2007). Although ADHD is common into adulthood, there has long been a big misperception that this is not so (Wilens, 2004). Significant symptoms and impairment continue into adulthood in more than 50% of cases, while other researchers posit 80% of children diagnosed with ADHD in childhood will continue to meet diagnostic criteria as adults (Barkley, 1998; Barkley, Fischer, Smallish, & Fletcher, 2002; Wilens & Dodsen, 2004; Proctor & Prevatt, 2009). Recent figures for United States college students suggest that almost 3% of men and almost 4% of women report symptoms of ADHD significant enough to warrant a diagnosis (DuPaul et al., 2001). Importantly, the DSM-IV-TR criteria are based on studies of individuals ages 4-17, thus the terms used to describe symptoms may not represent true adult presentations and may result in unrepresentative prevalence rates (Goodman, 2007).

**Etiology**

The etiology of ADHD is multi-faceted. Research indicates that ADHD is linked to various neurological and genetic or biological associated factors, rather than direct causes (Wilens et al., 2004). These neurological and genetic factors can be exacerbated by environmental and psychosocial factors. Family, twin, adoption, and molecular genetic studies show that genes influence the etiology of ADHD and the disorder has a heritability of .8, which
is the highest of any psychiatric disorder (Levy, Hay, McStephen, Wood, & Waldman, 1997). Studies of children and adults have found evidence for the involvement of several genes in the etiology of ADHD, some of which include the D2 dopamine receptor gene, the dopamine transporter gene, and the D4 dopamine receptor gene (Faraone, 2002).

Substantial research points to structural brain abnormalities in adults with ADHD (Epstein, Conners, Erhardt, March, & Swanson, 1997; Hervey, Epstein, & Curry, 2004; Johnson et al., 2001). Functional magnetic resonance imaging (FMRI) and positron emission tomographic (PET) images suggest that ADHD dysfunction originates in the caudate and putamen within the basal ganglia, implicated in learning, memory, language comprehension, and motor control, as well as the prefrontal cortex, the anterior part of the frontal lobes implicated in executive functioning, leading to simple and complex cognitive dysfunction (Bush, Valera, & Seidman, 2005; Hale, Bookheimer, McGough, Phillips, McCracken, 2007). FMRI and PET studies have continuously found reductions in cortical gray matter in the prefrontal cortex, dorsolateral prefrontal cortex, cerebellum, and subcortical structures (e.g., globus pallidus) in the brains of those with ADHD, which can create interruptions in executive functions, motor control, attention, language, behavior regulation, and modulation of reward pathways (Seidman, Valera, & Bush, 2004). Seidman et al. (2006) found that the anterior cingulated cortex displayed the greatest reductions in gray matter among those with ADHD, a part of the brain implicated in reward anticipation, decision-making, attention, motivation, error detection, and modulation of emotional responses. Several other specific areas of the brain have been found to demonstrate anomalies in those with ADHD, some of which include: right prefrontal and parietal cortex, which is activated during sustained and directed attention across sensory modalities; inferior parietal lobe and superior temporal sulcus, which play a role in focusing on and selecting a target
stimuli; brain stem reticular activating system and reticular thalamic nuclei, which regulate attentional tone and filter interference; and the anterior hippocampus, ventral anterior, dorsolateral thalamus, and dorsolateral prefrontal cortex that all play a part in memory (Faraone & Biederman, 2002; Posner & Peterson, 1990).

**Diagnostic/ Special Consideration**

DSM-IV-TR ADHD criteria are based on studies of individuals ages 4-17, thus the terms used to describe symptoms may not represent true adult presentation (Goodman, 2007). Since the DSM-IV-TR ADHD criteria are not validated for adult populations this may result in underdiagnosis of some individuals who might benefit greatly from intervention. In addition, many measures used to assess ADHD are based on the DSM-IV-TR criteria and being designed for children such measures may be limited in their ability to accurately assess adults. Previous studies relying on self-report may have underestimated persistence of ADHD into adulthood. Child self-report tends to underestimate ADHD diagnosis and this pattern was found in adults (Barkley et al., 2002).

ADHD symptoms can manifest in other disorders, creating another layer of complication in the diagnostic process. Such symptom overlap can lead to inaccurately attributing a client’s symptoms to ADHD or alternatively, neglecting to diagnose a client with ADHD when the clinical picture would warrant doing so and instead associating their symptoms with a different disorder. To best prevent such misdiagnoses, it is imperative to be cognizant of longitudinal symptoms and impairments, as well as cognitive deficits that could be due to another disorder (Wilens et al., 2004). Because ADHD is highly comorbid with a myriad of disorders, it is not uncommon for the presence of comorbid conditions to distract clinicians from recognizing ADHD in clients. Inattention particularly is common across many disorders and thus provides
little diagnostic value. Furthermore, ADHD symptoms are on a continuum and are thus hard to quantify (Goodman, 2007). In some cases individuals are being treated for medical disorders that have similar presentations to ADHD, thereby preventing the correct ADHD diagnosis from being made (Spencer, 2008).

Beyond misdiagnosis issues related to symptom overlap, many adults with ADHD never receive a diagnosis because their symptoms are instead attributed to motivational or intellectual deficits. The lack of a precise physiologic marker for ADHD further increases the difficulty of making accurate a diagnosis. However, data are now accumulating that provide insight into neurobiological aspects of ADHD (Goodman, 2007).

Impairment

Not only do the primary symptoms of ADHD (inattention and hyperactivity-impulsivity) impact individuals, but also the myriad of associated impairments and comorbid disorders associated with ADHD can create a significant cumulative effect (Goodman, 2007). The World Health Organization Disability Assessment Schedule (WHO-DAS) found that individuals with ADHD display significantly elevated odds of disability in all three basic areas of basic functioning (self care, mobility, and cognition) as well as all three dimension of instrumental functioning (days out of role, productive role functioning, and social role functioning) (Kessler et al., 2006).

Cognitive. Individuals with ADHD have been found to display significantly elevated rates of impairment in cognition (Kessler et al., 2006). Executive functioning deficits are among the most common of the cognitive deficits found in adults with ADHD (Wilens et al., 2004). Executive functioning affects the complex processes regulating self-sufficiency, responsible behavior, organization, social skills, and planning and concern for the future. In adults with
ADHD, executive functioning deficits manifest frequently as difficulties with sustained attention, working memory, and verbal fluency (Boonstra, Oosterlaan, Sergeant, & Buitelaar, 2005). In addition, learning disabilities are common in individuals with ADHD (Goodman, 2007).

**Academic.** Challenges in the academic sphere are common among individuals with ADHD, even for those with a high IQ (Nadeau, 2005). Often the rigor of academia can be too demanding to allow such individuals to compensate for their ADHD symptoms. In college individuals with ADHD display lower grades, lower completion rates, and more time to complete degree (Wilens et al., 2004). College students with ADHD report lower scores in time management, concentration, motivation, test taking skills, and study strategies (Reaser, Prevatt, Petscher, & Proctor, 2007). A community survey by Biederman et al. (2006a) of 1001 adults found that those with ADHD reported being less likely to handle a large academic workload, concentrate on their schoolwork, or organize their assignments, and these academic difficulties along with difficulties in attention, concentration, and organization persisted into adulthood (Biederman et al., 2006a). Barkley, Fischer, Edelbrock, and Smallish (1990) found that adolescents diagnosed with ADHD in childhood are three times more likely to drop out or be expelled from school as to compared with adolescents without ADHD.

**Work force.** Procrastination, forgetfulness, and disorganization are often characteristic of adults with ADHD, making success in the job market more challenging (Goodman, 2007). A study by Biederman et al. (2006a) following adults with and without ADHD for 13 years found that adults with ADHD are three times as likely to be unemployed. Participants with ADHD who were employed had changed jobs more frequently over the preceding 10 years than those without ADHD (Biederman et al., 2006a). Individuals with ADHD are found on average to have lower
socioeconomic status and poor employment records (Goodman, 2007; Wilens et al., 2004).

Research has found that individuals with ADHD are more at risk for decreased quality of work (productive role functioning) and more at risk for having increased days in which they are completely unable to carry out their daily activities or cut back on the amount they accomplish or the amount of time they devote (days out of role) (Kessler et al., 2006). Considering individuals with ADHD have increased difficulty functioning effectively in the academic and work spheres which is reflected in their lower grades, higher drop out rates, increased grade failure, lower rates of college completion, higher unemployment rates, and on average lower socioeconomic status and poor employment records, in combination with evidence indicating those with ADHD tend to be highly self-critical, it is no surprise that the inner experience of such individuals is often marked by a sense of underachievement, feelings of shame, and poor self-esteem (Goodman, 2007).

**Interpersonal relationships/Family life.** Research suggests that ADHD impacts individuals’ functioning in a way that adversely impacts their family environment and interpersonal relationship as a whole. Impairment in social role functioning has been shown to be significantly elevated in individual with ADHD (Kessler et al., 2006). Such individuals on average have a tendency towards agitation, impatience, low frustration tolerance, frequent anger, poor judgment, and argumentativeness, all of which can create increased conflict and challenges in interpersonal relationships (Clarke, Heussler, & Kohn, 2005; Goodman, 2007; Wilens et al., 2004). In addition, the constant activity that is characteristic of some individuals with ADHD can cause tension in a home environment.

Research indicates that adults with ADHD often have tense or unstable relationships with significant others and poor perceptions of their ability to provide emotional support. Difficulty
refraining from interrupting in conversation can make listening skills appear weaker in adults with ADHD and can make communication more difficult, particularly when issues arise in a relationship (Adler & Cohen, 2004). Adults with ADHD report an increased tendency towards anti-social behavior, which is not typically adaptive in close relationships (Biederman et al., 2006a). Further, the sexual component of romantic relationships may present increased challenges for those with ADHD. In a longitudinal study, Weiss and Hechtman (1993) found that approximately 20% of adults with ADHD reported experiencing difficulties with sexual adjustment. Furthermore, a population survey of 500 ADHD adults and 501 gender and age matched adults without ADHD conducted by Biederman et al. (2006a) found that adults with ADHD are twice as likely to be divorced (Wilens et al. 2004) and adults with untreated ADHD are also four times as likely to contract a sexually transmitted disease (Barkley et al., 2006).

**Societal Impact.** ADHD not only takes a toll on the individual experiencing the symptoms, but also significantly impacts society as a whole (Wasserstein, 2005). Research suggests that adults with ADHD are at increased risk for criminal activity and incarceration (Eyestone & Howell, 1994; Goodman, 2007; Rosler et al., 2004). Biederman et al. (2006a) found that adults with ADHD are twice as likely to have been arrested, explained in part by the higher rates of antisocial personality disorder, substance abuse, and arrests for possession, use, and sale of illegal drugs among individuals with ADHD (Barkley et al., 2004; Mannuzza et al., 1993; Mannuzza et al., 1997; Mannuzza et al., 1998). Furthermore, Wasserstein (2005) found that ADHD is correlated with increased medical utilization of more than 50% compared to controls and excluding treatment for ADHD itself. A retrospective study with 4,504 participants found that compared to controls, adults with ADHD had significantly higher total medical costs including significantly higher costs for outpatient treatment, inpatient treatment, and prescription
drugs (Secnik, Swensen, & Lage, 2005). Individuals with ADHD also demonstrate increased healthcare utilization compared to controls for not only ADHD related care, but non-ADHD issues (Wasserstein, 2005). Swensen et al. (2004) found that adults with ADHD had significantly more accident claims and significantly higher costs associated with those accidents compared to controls. The cost to society does not stop there when considering that those with ADHD are less likely to be employed full time and the household income for those 25 and older with ADHD is significantly lower compared to controls. Biederman and Faraone (2006) found that ADHD results in a loss of income estimated between 67 and 116 billion annually.

**ADHD & Psychological Functioning.** ADHD frequently co-occurs with a myriad of mental health disorders as evidenced by an 80% rate of lifetime comorbidity (Goodman, 2007). A retrospective analysis of data from more than 2000 adults with ADHD matched 1 to 1 with individuals who did not have ADHD identified anxiety, bipolar disorder, depression, drug or alcohol use, and antisocial behavior as frequent comorbidities (Secnik et al., 2005). Results from the National Comorbidity Survey Replication found the following lifetime prevalence rates among individuals with ADHD: 45% for mood disorders, 69% for anxiety, 36% for substance abuse disorders, 70% for impulse disorders (antisocial personality, oppositional defiant conduct, and intermittent explosive disorder), and 89% for any psychiatric disorder (Kessler et al., 2006; Kessler & Merikangas, 2004). When considering that the lives of those with ADHD are often marked by difficulty functioning in the world, it is not surprising that such individuals often experience co-occurring symptoms of anxiety and depression, and have higher rates of alcohol abuse. It is important to note that most of the research on the relationship between ADHD and concurrent presenting problems has been on children or adolescents.
Depression. The prevalence of Major Depressive Disorder (MDD) in adults with ADHD is 18.6%, according to the National Comorbidity Survey Replication study (Kessler et al., 2006). Co-occurring ADHD and MDD is associated with increased negative social and occupational long-term outcomes (Sobanski et al., 2007). Multigenerational studies have demonstrated a potential genetic link between ADHD and depression, as research findings have shown that the children of adults with recurrent depression have a higher prevalence of ADHD compared to the general population. In addition, higher rates of MDD have been found in first-degree relatives of children with ADHD (Biederman, Faraone, Keenan, & Tsuang, 1991b; Biederman et al., 1987). Although no definite conclusion exists regarding the direction or nature of the relationship between ADHD and depression, numerous studies and theories have provided suggestions. Biederman et al. (2008) demonstrated that girls with ADHD had an increased risk of developing MDD compared to those without ADHD, and MDD in this population was marked by earlier, greater duration, and more severe MDD associated impairment including psychiatric hospitalization and increased suicidality. Consistent with these findings, Biederman et al. (2010) found that girls with ADHD had significantly higher rates of MDD in young adulthood relative to those without ADHD. Similarly, Burke, Loeber, Lahey, and Rathouz (2005) found among a sample of adolescent boys that ADHD predicted a later diagnosis of oppositional defiant disorder, which then predicted later depression. An explanation offered for this finding was that children with ADHD have increased difficulty socially and scholastically, which may cause them to act out and unfortunately as a result be faced with increased struggle in school and with peers, thereby precipitating symptoms of depression. Taken together, these studies suggest that ADHD is a risk factor or predictor for MDD.
Research indicates that children with ADHD and depression are less socially competent relative to children with ADHD only or those without ADHD (Blackman, Ostrander, & Herman, 2005). Ostrander, Crygla, and August (2006) found that others’ appraisals of social competence mediated about half of the relationship between ADHD and depression in younger children. Results indicated that during the later part of the childhood years, this relationship was further mediated by self-appraisals of social competence. Expanding upon these findings, Ostrander and his team recently conducted interviews surveying parents, children, and teachers in several community based studies and found that social interactions, inconsistent parenting, and academic problems stood out as the three critical psychological elements involved in the development of depression in children with ADHD (Centofanti, 2011). Ostrander (Centofanti, 2011) elaborates:

The idea, if you have ADHD is that it can lead to parents not responding to you predictably, to other kids not liking you very much, to teachers saying you're unreliable or careless and marking you as ‘difficult’. This filters back to a child early on as overwhelmingly negative feedback. (p. 1).

Receiving these negative messages about the self contributes to the formation of a negative mindset and mood and affects children more as they get older and start to take these messages more personally. Ostrander et al. explain that this is the time children experience a deep sense of inability to control what happens to them as they experience being unable to regulate their behavior and emotions and this combination of lack of control and negative mindset sets the groundwork for the onset of depression (Centofanti, 2011).

**Anxiety.** According to the National Comorbidity Survey Replication study, 8% of adults with ADHD have Generalized Anxiety Disorder (Kessler et al., 2006). An understanding of the particular temporal nature of the relationship between ADHD and anxiety remains unclear at this time, however some ideas can be gleaned from previous research. Safren (2001) found that
adults with Generalized Anxiety Disorder (GAD) have a higher incidence of childhood ADHD relative to population estimates of ADHD, which has been consistent with past research (Biederman et al., 1993; Biederman et al., 1996). In Safren’s study the onset of ADHD preceded the emergence of GAD in all cases. Adults with a primary diagnosis of GAD have also been found to have a significantly higher prevalence of childhood ADHD compared to those with Social Phobia (Safren, Lanka, Otto, & Pollack, 2001). In addition, Biederman et al. (2010) found that girls with ADHD had a significant higher likelihood of anxiety disorders in young adulthood compared to control participants. Research examining the affects of the interaction between anxiety and ADHD has found that the presence of anxiety serves to increase response inhibition and improve impulsivity, while at the same time making working memory and other cognitive impairments worse (Manassis, Tannock, & Barbosa, 2000; Oosterlan & Sergeant, 1998a; Schatz & Rostain, 2006). Numerous hypotheses have been proposed to explain the relationship between anxiety and ADHD, and one frequently seen in the research posits that the chronic failure experienced by children with ADHD leads to the development of anxiety (Tannock, 2000).

Family studies have provided evidence that ADHD and anxiety are independently transmitted in families, thus have separate genetic transmission. Such studies have demonstrated that the risk for anxiety disorders was significantly higher for relatives of probands with ADHD and anxiety compared to probands with ADHD only, and the groups did not differ on risk for ADHD (Biederman, Faraone, Keenan, Steingard, & Tsuang, 1991a; Braaten et al., 2003; Biederman et al., 1992; Braatan et al., 2003). In addition, a strong correlation has been found between parental anxiety disorders and comorbid anxiety disorders in children with ADHD (Pfiffner et al., 1999).
**Alcohol Abuse.** Approximately 6% of adults with ADHD also present with alcohol abuse according to the National Comorbidity Survey Replication study (Kessler et al., 2006). Among a young adult sample, Weiss and Hechtman (1993) found that significantly more participants with ADHD met criteria for alcohol abuse or dependence compared to the control participants, although rates of alcohol use were the same for those with and without ADHD. These findings suggest that individuals with ADHD may be more likely to use alcohol excessively relative to those without ADHD. Research indicates that the link between ADHD and alcohol related disorders are most prevalent in people with conduct disorder or other severe behavioral problems (Smith, Molina, & Pelham, 2002). Potential mediating factors between ADHD and alcohol abuse include disturbances in the dopamine system of both disorders (Hyman & Malenka, 2001; Solanto, 2002), the possibility that people with ADHD have a lower threshold for alcohol related problems (Smith et al., 2002), the use of alcohol to self-medicate distress related to ADHD (Wilens, 1998), and the social and academic difficulties faced by children with ADHD (Smith et al., 2002). Increased rates of ADHD have been found in children of alcoholics compared to children of controls, with even higher rates seen when both parents abused alcohol (Earls, Reich, Jung, & Cloninger, 1988). Elevated rates of alcoholism have been seen in the parents of children with ADHD (Cantwell, 1972; Morrison & Stewart, 1971). Although the exact nature of the relationship between ADHD and alcohol use is unclear, research demonstrates that alcohol use is subsequent to the onset of ADHD (Bradley, Brooke, Molina, & William, 2002).

Considering that adult ADHD often co-occurs with depression, anxiety, or alcohol abuse, it would be important that those with ADHD and 1 or more of the aforementioned co-occurring disorders receive treatment that addresses all of their presenting problems. However,
unfortunately this is often not the case. Most often it’s ADHD that’s doesn’t get treated, which is in part because adult ADHD has only became a valid adult diagnosis in the past few years, resulting in underdiagnosis and ultimately less adults seeking treatment for this disorder than actually have a need for such treatment. (Goodman, 2007).

**Low treatment rates for Adult ADHD.** Unfortunately, the majority of individuals with ADHD are not being treated. Kessler et al. (2006) found that while approximately 40% of those with ADHD were receiving treatment for mental health or substance problems, only approximately 10% were being treated for ADHD. This treatment rate is much lower than for anxiety, mood, or substance disorders. It may be that the high impairment rate among individuals with ADHD is due not only to the chronic nature of the disorder, but also the low treatment rates.

**Current Treatments for ADHD**

**Medications.** Psychostimulants are currently seen as the standard of care and an effective “first line” treatment for ADHD patients of all ages (AACAP, 1997, 2002; Wilens et al., 2000). However, it should be noted that to date the superiority of medication for ADHD treatment has only been established in children (MTA Cooperative, 1999). No studies have yet been conducted directly comparing psychological versus medication treatment in adults (Weiss et al., 2008). Nevertheless, most health care professionals assume medication to be the front line treatment for adult ADHD.

Although psychostimulants can offer significant symptom relief, they have a variable response estimated between 25 to 78% for adults (Wilens & Dodson, 2004). Stimulants increase alertness and attentional difficulties, decrease hyperactivity, reduce distractibility, improve restlessness, and increase motor control (Pliska, 2007; Kolar et al., 2008; Connor, 2005; Swanson et al., 1993). Methylphenidates, mixed amphetamine salts, and dextroamphetamines are
among the most popular psychostimulants (Wilens & Dodson, 2004). To test the effectiveness of the aforementioned stimulants in treating primary symptoms of ADHD over two-hundred fifty controlled trials have been conducted and consistently demonstrated significant ADHD symptom improvement (Biederman et al., 2006b; Faraone, Biederman, Spencer, & Aleardi, 2006; Faraone & Glatt, 2010; Greenhill et al., 2006; Peterson, McDonagh, & Fu, 2008; Weisler et al., 2006). Amphetamines have also been associated with significant improvements in quality of life which includes improvements in physical and mental health, vitality, perception of living with ADHD and performance, relationships/communication, and social, emotional, and physical role functioning (Weisler et al., 2006; Landgraf, 2007). Research has demonstrated sustained improvements for stimulants, suggesting ongoing effectiveness and lack of tolerance development (Adler, Spencer, McGough, Jiang, & Muniz, 2005a; Biederman, 2004; Spencer et al., 2007;). The most common treatment emergent adverse effects for stimulants are dry mouth, decreased appetite, insomnia, headache, weight loss, agitation, nausea, a jittery feeling, and anxiety (Spencer et al., 1995a, 2005).

The only non-stimulant medication approved by the FDA for the treatment of adult ADHD is amoxetine (Strattera), a norepinephrine specific reuptake inhibitor that specifically inhibits presynaptic norepinephrine (Goodman, 2007). Atomoxetine has been demonstrated efficacious in reducing symptoms of inattention, hyperactivity, and impulsivity associated with ADHD and an open-label extension demonstrated that amoxetine maintained symptom improvement (Adler, Spencer, Milton, Moore, & Michelson, 2005b; Michelson et al., 2003). Amoxetine’s lack of abuse potential may also be an advantage for some patients (Michelson et al., 2003). Adults with ADHD treated with amoxetine have demonstrated significant improvements in overall mental health, suggesting its role in improving perceived quality of life.
(Adler et al., 2006). Adverse effects reported more frequently than placebo are dry mouth, insomnia, nausea, constipation, decreased appetite, dizziness, sexual difficulties, and urinary retention (Adler et al., 2005b). Furthermore, the anti-depressants bupropion and desipramine are sometimes used to treat adult ADHD and have demonstrated a positive effect in randomized controlled trials, although not approved by the FDA for the treatment of ADHD (Wilens et al., 1996; Wilens et al., 2005). Although non-stimulants can be effective in treating ADHD, it should be noted that a meta-analysis by Faraone et al. (2006) found that effect sizes for stimulants were significantly greater than those for non-stimulants.

Along with the myriad of potentially problematic side effects associated with the medications to treat ADHD, there are a plethora of additional issues related to such medications that suggest they are no panacea for many adults with ADHD. The response rate to stimulant medications is quite variable, as research suggests that pharmacotherapy alone is inadequate treatment for up to 50% of adults with ADHD (Wilens et al., 2000). Half of adults cannot take medication, do not respond, or experience continued difficulty (Wilens et al., 2000). Even when medication proves helpful in targeting core symptoms of ADHD, satisfactory improvements in functional impairments such as time management, organization, planning, and self-esteem are not always seen (Weiss et al., 1999). In addition, the potential for psychopharmaceutical treatments to improve symptoms and associated impairments of ADHD is predicated on actually taking one’s prescription, therefore those with ADHD who find psychopharmaceutical treatment effective must take medication life long if wanting to continue experiencing the medication’s effects (Wilens et al., 2004). Further, clinicians have traditionally been reluctant to prescribe a controlled substance that has the potential for abuse, that can cause positive drug screens results, and usually needs a new written prescription monthly for each treated patient. For these same
reasons, many patients have been reluctant to take such medications (Montano, 2004). Additionally, more complex presentations of ADHD including those with comorbid diagnoses or individuals with ADHD related difficulties who have been undiagnosed or under-diagnosed until adulthood are often unresponsive to medication (Ramsay & Rostain, 2007).

**Psychosocial interventions.** Although ADHD is most frequently treated with psychotropic medications, it is evident they are not a panacea and psychosocial interventions for ADHD are an often-overlooked treatment option. However, at this time there is minimal research examining the outcome of employing psychosocial interventions for adults with ADHD. The number of published empirical studies is limited and of those that exist, many do not include a control group and only 3 randomly assigned participants to groups (Weiss et al., 2008; Ramsay & Rostain, 2007).

The majority of research on psychosocial treatments for adult ADHD is focused on cognitive behavioral therapy (CBT). The reasoning behind using CBT to treat ADHD was based on the following: Often those with ADHD face increased difficulty and struggle accomplishing tasks because of inattentiveness, hyperactivity, and/or impulsivity, as well as associated impairments, resulting in an aversive experience and the desire to avoid certain tasks. Negative cognitions begin emerging around such experiences (e.g., I’m a failure, getting done is hopeless, I can’t do anything right) and further intensify task avoidance, negative affect, and lack of motivation, thereby hindering the potential for symptom control (McDermott, 2000; Safren et al., 2005; Safren, Sprich, Chulvick, & Otto, 2004; Wilens et al., 1999). Thus CBT was thought to be a good fit because it has the ability to interrupt this self-perpetuating loop of avoidance, as CBT targets negative cognitions that are contributing to negative affect and preventing individuals from doing what they need to in their lives. Specifically, most CBT treatments for ADHD focus
on promoting and cultivating self-regulating behaviors and thereby changing disruptive behaviors or thought patterns that interfere with day-to-day activities, while typically addressing time management, organizational skills, and self-regulation strategies. The few randomized controlled trials (RCTs) that have examined the effectiveness of both group and individual CBT for adults with ADHD have found significant results (Safren et al., 2010; Solanto et al., 2010). In a RCT examining medication treatment compared to CBT in combination with ADHD medication, results indicated that a combination of CBT and medication was superior to medication alone in treating ADHD and moderately more effective in treating depression and anxiety (Safren et al., 2005). Cognitive Remediation Program (CRP) is another type of psychosocial treatment that has demonstrated significant improvement in ADHD symptoms post treatment and when including both a group format and individual coach, ahs demonstrated maintenance of gains at one year follow up (Whitmont, Bornholt, Livesey, & Stevenson, 2002). CRP focuses on retraining cognitive functions, teaching ways to compensate, and helping clients create a work and home environment that is most conducive to their functioning. A directed CRP program with minimal therapist contact demonstrated significant improvements post treatment and maintenance of most gains at 2-month follow up in a wait-list RCT (Stevenson, Stevenson, & Whitmont, 2003).

Although adults are the population of interest for this thesis, the Multimodal Treatment Study of Children with ADHD (MTA) is noteworthy, as it is the largest study to date comparing treatment methods for ADHD, (The MTA Cooperative Group, 1999). With a sample of 579 children, the MTA compared the effects of medication management, behavioral modification therapy, their combination, and usual community care (two-thirds of participants in this group reporting receiving medication). At 14-month follow-up, results demonstrated that medication
management and combination (medication plus behavioral therapy) were superior to behavioral therapy alone and community care, and this finding persisted at 24-month follow up, though not as strongly (2004). Importantly, there were no statistical differences found between medication alone and medication combined with behavioral therapy in regards to primary ADHD symptoms (The MTA Cooperative Group, 1999). These findings suggest that in regards to ADHD symptom reduction, behavioral therapy may not add any value to ADHD symptom reduction above and beyond that which medication does. At thirty-six month follow up, there were no significant differences found between any of the treatment groups (Jensen et al., 2007).

Taken together, the empirical studies to date on psychosocial treatments for adult ADHD found large effect sizes for ADHD symptoms and smaller effect sizes for internalizing symptoms, self-esteem, and anger management (Weiss et al., 2008). However, these results (excluding MTA study) must be seen in light of numerous limitations which limit the generalizability of the findings and these include: small sample sizes, the majority of participants were Caucasian, most participants were employed and/or had completed high school which does not represent the ADHD population at large, only five studies were randomized controlled trials, only three studies used another treatment group as a basis for comparison (Safren at al., 2005), and there is minimal outcome data on maintenance of treatment gains (Ramsey & Rostain, 2007).

Although continued empirical examination of existing psychosocial treatments is important, there is also a critical need for the development of alternative treatment options that not only produce strong effects on ADHD symptoms, but also have an equal impact on targeting additional presenting comorbidities. The fact that such a small percentage of those with ADHD receive treatment further emphasizes the need for the development of effective alternative
treatments that have the potential to reach this largely untreated population. Not only does ADHD have a high rate of comorbidity, but also those with comorbid ADHD are often the most unresponsive to treatment. There is an incredible need for treatment options that can prove helpful for such individuals, as the cumulative effect on levels of distress, impairment, and quality of life for those with comorbidity, is often tremendous. Research suggests that much of the impairment experienced by individuals with ADHD may be associated with the comorbid conditions that are often present, further suggesting a need to focus attention on the development of treatments that target these comorbidities as well (Newcorn, 2008; Stein, 2008). Mindfulness-based treatments may be one alternative.

Mindfulness

**Definition.** The term mindfulness is the English attempted translation of the word *smrtri* (in Sanskrit), *Sati* (in Pali), and *Dran-pa* (in Tibetan) (Shapiro, Oman, Thoresen, Plante, & Flinders, 2008). There is no one agreed upon meaning of the term mindfulness, however one common definition is the state of “awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmental to the unfolding of experience moment by moment” (Kabat-Zinn, 2003, p. 145). Bishop et al. (2004) operationalized mindfulness as the self-regulation of attention characterized by curiosity, openness, and acceptance. Mindfulness has been referred to as bare attention by Theravada scholar Bodhi (2000), describing a type of attention in which we remove our conditioned emotional reactions, evaluations, and conceptual overlays (Bodhi, 2006). A more specific explanation of mindfulness includes three parts: 1) intention in regards to knowing why one is paying attention and encompassing motivation, a conscious direction, and purpose 2) attention, which speaks to directly knowing what is happening as it is happening and 3) an attitude that is accepting, caring, and discerning (Shapiro,
Carlson, Astin, & Freedman, 2006). Affection, compassion, and a sense of openhearted friendly presence and interest underlie the attentional stance or attending, as the words for mind and heart are the same in Asian languages (Kabat-Zinn, 2003).

**Background.** Mindfulness is embedded in the teachings of the Buddha and has traditionally been called “the heart of Buddhist meditation” (Thera, 1962; Gunaratana, 1992; Hanh, 1999; Nanamoli & Bodhi, 1995). The Buddhist tradition often associates specific methods of meditation marked by recollection, care, and circumspection with the term mindfulness (Thera, 1962). It should be noted that among different forms of Buddhism and even with the same traditions sometimes, the actual practices and emphases regarding mindfulness can vary considerably (Goldstein, 2002). Buddhism encompasses a conceptual and practice-oriented ethical framework based upon non-harming and the actual mindfulness-based practices fall within this larger framework. Non-harming reflects the idea that unexamined behavior or an untrained mind contributes directly to human suffering for yourself and others. The view is that meditative practices can address this suffering and calm and clarify the mind. Mindfulness-based practices fall under this larger conceptual and practice-oriented ethical framework and address the transmutation of that suffering through meditative practices that calm and clarify the mind (Kabat-Zinn, 2003).

Being that mindfulness is about specific qualities of attention and awareness, it is not something limited to just Buddhists but is an inherently universal capacity of humans, though people vary in their degree of mindfulness in relation to others and from moment to moment (Brown & Ryan, 2003). However, over the past 2,500 years the Buddhist tradition has been most figural in developing and articulating ways to cultivate this inherent quality of attention and awareness. Although mindfulness is most linked to Buddhism, it should be noted that its essence
is reflected in other traditions and teachings (see, for example, Chuang Tsu, 1964; Krishnamurti, 1999; Maharaj, 1973; Maharshi, 1959; Thakar, 1972; Tolle, 1999).

Although it took nearly 2,500 years, approximately 25 years ago interest in Buddhist meditation and its potential applicability to the Western medical and mental health spheres began to emerge. The past several years have seen an explosion of attention towards mindfulness by researchers and health care professionals. Due to the growing research suggesting mindfulness’ effectiveness in both enhancing well being and treating both medical and mental health concerns, the incorporation of mindfulness into medical and mental health treatment is continually increasing.

Concentration vs. Mindfulness Meditation. Meditation is often differentiated between either a concentrative or mindfulness approach or practice. Concentration meditation is thought to improve concentrative attention, whereas mindfulness meditation is considered to improve receptive attention (Brown, 1977; Delmonte, 1987; Pfeiffer, 1966; Semple, 1999; Speeth, 1982; Valentine & Sweet, 1999). In concentration meditation attention is focused in a “one-pointed” manner often on the breath, a mantra, or an image. In contrast, in mindfulness meditation attention is not directed or limited in any way, and attention is open to the whole field of awareness and experience. In this state of receptive attention, sensations, thoughts, emotions, and memories are not deemed distracters as they are in concentration meditation. In mindfulness meditation training individuals are trained to become aware of each perception or thought as it passes through the mind without reacting to it. In mindfulness training and meditation texts, it is often recommended that individuals first practice concentration meditation to cultivate concentrative attention before beginning a mindfulness meditation practice, as it is thought that without the cultivation of concentrative attention people more easily become lost in thoughts,
images, or emotions and have difficult grounding to their present experience (Brown, 1977; Kapleau, 1965; Smallwood & Schooler, 2006;). Some traditions believe receptive attention is a natural result of continued practice in concentration meditation and is not something that can be developed through formal training (Lutz, Dunne, & Davidson, 2007; Trungpa, 1975).

Mechanisms of Change. Research to date suggests a number of different mechanisms underlying the symptom reduction and positive change found to be associated with increased mindfulness. (Baer, 2003).

Exposure. Mindfulness Based Stress Reduction (MBSR), the first significant mindfulness based treatment in the West, was first introduced for patients with chronic pain. An important component of this treatment involves seated meditation practice and pain is inevitably arises in extended periods of sitting. Participants are encouraged to focus directly on whatever sensations arise and nonjudgementally observe such sensations and any accompany thoughts, instead of shifting positions to alleviate the pain. It is suggested that by letting go of judgment of pain, and instead simply observing the sensations without any story line attached, distress can be lowered. Specifically for patients with chronic pain, having extended experiences sitting with their pain and seeing nothing catastrophic result may decrease their emotional reactivity to their sensations (Kabat-Zinn, 1982). Similarly, in patients with anxiety or panic symptoms, the prolonged experience of non judgmentally observing such feelings instead of avoiding may ultimately decrease the emotional reactivity triggered by anxiety or panic and overtime extinguish the fear response and avoidance behaviors, as seen in introceptive exposure (Barlow & Craske, 2000; Kabat-Zinn et al., 1992; Linehan, 1993a, 1993b).

Cognitive Change. It is suggested that mindfulness practice can shift a person’s relationship to their thoughts. Kabat-Zinn (1982, 1990) and Linehan (1993a, 1993b) suggest that
the non-judgmental observation of one’s thoughts, feelings, or sensations may lead to the ability to see such things as simply what they are and not representative of who we are, the truth, or reality. In addition, it is suggested that some avoidance behaviors are associated with thoughts that are seen and felt as aversive, triggering the need to escape. It is suggested that cultivating a non-judgmental attitude towards such thoughts may reduce avoidance behaviors (Heatherton & Baumeister, 1991). Teasdale (1999) and Teasdale et al. (1995) suggest that mindfulness training may reduce ruminative thinking often common among individuals in a Major Depressive Episode as individuals practice cultivating a new relationship with their thoughts. An RCT conducted by Jain et al. (2007) found that the reduced distress demonstrated in students after participation in a 4-week mindfulness mediation training was due to decreases in rumination (Jain et al., 2007). Similarly, significant reductions in ruminative thinking were found among participants with a history of depression after an 8-week mindfulness meditation training (Ramel, Goldin, Carmona, & McQuaid, 2004).

**Self-management.** Many researchers posit that the increased awareness and observational stance that comes with mindfulness training may enhance people’s ability to effectively take care of themselves when encountering internal or external stimuli deemed aversive or when noticing an urge to engage in a destructive behavior. Individuals with an increased attunement to their experience may more readily notice early signals of a problem and respond by using coping skills before a problem further intensifies, decreasing the likelihood of depressive relapses, binge eating episodes, or stress responses to painful sensations, for example (Kabat-Zinn, 1982; Marlatt, 1994; Teasdale, 1995). Linehan (1993a, 1993b) has suggested that one is more easily able to recognize the consequences of a behavior instead of internalizing blame or making global statements about one’s worth when practicing non-judgmental
observation and description. In addition, Linehan suggests that the continued practice of attending to the present moment can help cultivate control of attention, as empirical research has supported, and particularly help individuals whose struggles with inattention or “mind wandering” prevent them from completing important tasks.

Acceptance. One of the core aspects of mindfulness-based treatments is the acceptance of one’s physical, cognitive, and emotional experience as opposed to escaping, avoiding, or attempting to change them (Kabat-Zinn, 1990). It is thought that acceptance of unpleasant experiences, although not necessarily making the experience itself less unpleasant, reduces the associated fear that may manifests as anxiety or lead to destructive avoidance behaviors. Mindfulness training is suggested to facilitate the cultivation of acceptance (citations).

Mindfulness Based Therapies & Outcome

Mindfulness-Based Stress Reduction. Mindfulness based stressed reduction (MBSR), created by Jon Kabat-Zinn (Baer, 2003), consists of one 2-3 hour weekly group class lasting 8 week and 1 all day intensive mindfulness session. MBSR involves instruction on sitting meditation practices, body scan, mindful yoga, and the integration of mindfulness as a tool to cope with difficulties in daily life. Participants are encouraged to practice mindfulness while doing everyday activities, to practice formal meditation at home daily for 45 minutes throughout the program, and to record the total time spent in formal and informal home meditation.

A multitude of RCTs, most using wait-list controls, have demonstrated MBSR is effective in reducing self-reported distress, decreasing stress symptoms and mood disturbances, and increasing affect regulation (Astin, 1997; Monti et al., 2005; Shapiro et al., 1998; Speca, Carlson, Goodey, & Angen, 2000; Tacon, McComb, Caldera, & Randolph, 2003; Tacon et al., 2003; Williams, Kolar, Reger, & Pearson, 2001). Kabat-Zinn et al. (1992) found that in a sample
of individuals with Generalized Anxiety Disorder and Panic Disorder, participation in MBSR was associated with significant improvements in anxiety, as well as depression at post treatment and at 3-month follow up. At 3-year follow up treatment gains were still maintained (Miller, Fletcher, & Kabat-Zinn, 1995). An RCT involving premedical and medical students demonstrated an association between participation in MBSR and decreased self-reported state and strait anxiety and reduced overall psychological distress, including depression (Shapiro et al.; 1998). In a within subjects pre-post design of 18 female subjects with Binge Eating Disorder Kristeller and Hallett (1999) found that participation in MBSR results in significant improvements in several measures of eating mood. For patients with chronic pain, improvements have been demonstrated in ratings of pain, other medical symptoms, and general psychological symptoms with most changes maintained at follow up (Baer, 2003). Research findings to date have suggested that for patients with serious medical conditions including various forms of cancer, mindfulness practice may bolster disease resistance (Davidson et al., 2003) and lower levels of cortisol and normalized immune function (Carlson, Speca, Faris, & Patel, 2007; Witek-Janusek et al., 2008).

**Mindfulness-Based Cognitive Therapy.** Mindfulness-Based Cognitive Therapy (MBCT) was created by Segal, Williams, and Teasdale (2002) and is designed for patients who have had one or more previous depressive episodes. Rationale for this treatment approach is based upon the information processing theory of depressive relapse which posits that individuals who have experienced major depressive episodes are vulnerable to recurrences whenever mild dysphoric states are encountered, as these states may re-trigger the depressive cognitions present during the previous episode, or episode and lead to a new depressive episode (Baer, 2000). MBCT is thought to facilitate a decentered or detached relationship to one’s
thoughts or emotions through the practice of non-judgmental observation. Patients are encourage to view thoughts or feelings simply as things that are always coming and going, as well as changing, as opposed to reflections of who they are or the truth. Teasdale et al. (2000) conducted a RCT comparing MBCT to Treatment as usual (TAU) in a large sample of patients whose Major Depressive Disorder (MDD) had returned after treatment with medication. At least 12 weeks prior to participation in the study patients discontinued their medication. Findings indicated that during the 1 year follow up period MBCT resulted in substantially less relapse rates in comparison to TAU for individuals who had experience 3 or more previous Major Depressive Episodes. However, for individuals who had 1 or 2 previous Major Depressive Episodes the relapse rates did not differ between participation in MBCT or TAU. Ma & Teasdale (2004) found similar findings in a more recent RCT.

**Acceptance and Commitment Therapy.** Although Acceptance and Commitment Therapy (ACT), created by Hayes, Strosahl, and Wilson (1999) does not describe its treatment methods in terms of mindfulness or meditation, aspects of this treatment align quite perfectly with mindfulness. The focus of ACT is to increase patients’ ability to become fully aware of their present behavior and values, and then commit to aligning one’s behavior with these values. Research has demonstrated that increased acceptance is related to treatment outcome. An RCT conducted by Roemer, Orsillo, Salters-Pedneault (2008) assigning participants to either immediate or delayed ACT treatment demonstrated significant reductions in symptoms of Generalized Anxiety Disorder maintained at 3 and 9 month follow up and decreases in symptoms of depression. Treatment was associated with decreases in experiential avoidance and increases in mindfulness. Further, RCTs s have shown reductions in symptoms and re-hospitalizations of psychotic patients and reduced self-harming behavior, improved
emotional regulation, mental health, and stress in borderline personality disorder patients at
treatment completion that included components of both ACT and DBT (Bach & Hayes, 2002;
Gratz & Gunderson, 2006).

**Dialectical Behavior Therapy.** Dialectical Behavior Therapy, created by
Linehan (1993) was originally intended for patients with Borderline Personality Disorder and
incorporates mindfulness skills as one component of a multi-dimensional cognitive behavioral
treatment. (Baer, 2003). DBT is based upon the concept of dialectics and most emphasized in
treatment is the dialectic between acceptance and change. Mindfulness skills are taught in a
weekly skills group and participants are provided with various ways to incorporate mindfulness
into their lives and numerous exercises to practice mindfulness, however ultimately patients
work with their individual therapist to decide upon how they want to apply mindfulness in their
lives and a formal meditation practice is not required as part of treatment. DBT has mostly been
tested in patients with borderline personality disorder and has been shown to reduce distress
symptoms, suicidal ideation, psychiatric hospitalizations, improve social adjustment, and
increase global mental health functioning, with some studies showing treatment maintenance at 1
year follow up (Baer, 2003).

**Overall Effect Size.** A meta analysis by Baer (2003) of 18 pre-post test studies
examining the effects of mindfulness based treatments (MBT) for a range of symptoms found an
overall mean effect size of .59. These results reflect a medium effect size, though Baer (2003)
points out that many of the calculated effect sizes are conservative because particular statistics in
some studies were not reported, thereby affecting calculations. Hofman, Sawyer, Wit, and Oh
(2010) conducted a meta-analysis of 39 pre-post studies of MBTs in which all dependent
variables were restricted to anxiety and depression measures. MBTs demonstrated a moderate
Large or robust effect sizes were found for reducing anxiety and depressive symptoms when MBT was used with patients with anxiety (g=.97) or mood disorders (.95). In a meta analysis of both controlled and noncontrolled studies using both mental and physical health measures, an overall effect size of .5 was found for MBSR in treating a wide range of chronic disorders and problems (Grossman, Niemann, Schmidt, & Walach, 2004).

**Mindfulness & Alcohol or Drug Use.** Numerous studies have sought to examine whether alcohol or drug use is reduced following participation in mindfulness training. Bowen et al. (2006) found that inmates participating in a Vipassana meditation course experienced reductions in craving and subsequent decreases in alcohol and drug use. Vipassana literally means “seeing things the way they really are” and encourages “continuous, concentrated focus on the sensations, with a direct understanding of their impermanent nature,” which is thought to address the root cause of craving, thus a good fit for alcohol and drug addiction. Mindfulness Based Relapse Prevention (MBRP) is a treatment for those with alcohol or substance use addictions developed fairly recently and combines a cognitive behavior relapse prevention program (Marlatt & Gordon, 1985) with the format and some of the content of MBCT. MBRP targets negative mood, craving, and their roles in relapse and is designed for those who have already completed an intensive inpatient program. A pilot efficacy trial by Bowen et al. (2009) found that those participants engaging in MBRP after an intense stabilization period demonstrated less substance use and cravings, and greater increases in the “Acting with Awareness” and “Acceptance” subscales of the Five Factor Mindfulness Questionnaire (FFMQ) at four month follow up compared to the intense stabilization plus treatment as usual group (TAU). Cravings were found to significantly mediate the difference between treatment group
and substance use outcomes. Further, a study by Fernandez, Wood, Stein, and Rossi (2010) found that the “Describe” and “Acting with Awareness” factors of the Five Facet Mindfulness Questionnaire (FFMQ) were negatively correlated with alcohol use. The “Describe” factor signifies the process of identifying and labeling thoughts and feelings, particularly those that are intrusive and repetitive and is thought to counter the process of thought suppression, which has been found to mediate reductions in alcohol use following mindfulness training. Thus, the finding that increased scores on the “Describe” factor of the FFMQ were associated with decreased alcohol use supports the concept that avoiding thoughts encourages alcohol use, whereas noticing and labeling thoughts is associated with reductions in alcohol use. The “Act with Awareness” factor of the FFMQ signifies an ability to focus undivided attention on an activity and it’s been suggested that the increased awareness associated with this ability may interrupt impulsive behavioral tendencies, supporting the finding that individuals higher in “Acting with Awareness” were associated with less alcohol use (Fernandez et al., 2010).

It is important to note that not all studies on the relationship between mindfulness and alcohol use have demonstrated an inverse relationship. For example, two studies demonstrated that increases on the Mind/Body Awareness subscale of a mindfulness measure termed the Freiburg Mindfulness Inventory (FMI) were associated with increased frequency of binge drinking among college students (Leigh, Bowen, & Marlatt, 2005; Leigh & Neighbors, 2009). One possible explanation for this finding is that those more attune to their body sensations would not only be more motivated to avoid aversive sensations perhaps through using alcohol, but also would potentially experience an enhanced state of pleasure from alcohol because of their heightened ability to “tune in” to their bodily experience. Thus, it may be that such individuals’ heightened experience of both aversive and pleasurable sensations would increase their motivation to use substances such as alcohol to avoid pain and induce pleasure.
Further Mindfulness Findings & Connection to ADHD. Smalley, Lo, Hale, Shrestha, and McGough (2009) conducted a study with 105 adults participants, half meeting a diagnosis of ADHD, to examine whether individuals with ADHD have lower mindfulness scores than those who do not. Findings indicated that ADHD was associated with lower trait mindfulness, with attention suggested to substantially contribute to this relationship. Thus, those with ADHD may benefit from the myriad of positive outcomes associated with increased mindfulness such as increases in well being (Carmody & Baer, 2008; Orzech, Shapiro, Brown, & McKay, 2009), affect regulation (Brown & Ryan, 2003; Baer, Smith, & Allen, 2004), attention regulation (Jha, Krompinger, & Baime, 2007), and brain functioning (Lazar et al., 2005). In addition, research on mindfulness-based treatments (not specifically studying ADHD populations) has found mindfulness to be associated with improvements in numerous areas of functioning that appear to reflect many of the key areas of impairment in those with ADHD, providing support for the use of mindfulness interventions with this population (Lazar et al., 2005; Raz & Buhle, 2006; Tang et al., 2007). Furthermore, mindfulness training been shown to effectively treat many of the disorders that often co-occur with ADHD (Hayes, Strosahl, & Wilson, 1999; Kabat-Zinn et al., 1992; Marlatt et al., 2004; Miller, Fletcher, & Kabat-Zinn, 1995; Roemer, Orsillo, Salters-Pedneault, 2008;). It is important to note, Leigh et al. (2005) & Leigh & Neighbors (2009) demonstrated contrasting findings

Attention & The Brain. ADHD is often marked by impairments in attentional processes, and mindfulness by its nature involves a practice of working with one’s attention and awareness, with research demonstrating positive outcomes related to enhancements in attentional processes. Research suggests that mindfulness may be linked to the three primary attention networks: alerting attention, orienting attention, and executing attention (Raz & Buhle, 2006). Alerting
attention is marked by a steady uninterrupted attention to one’s experience, orienting attention is characterized by effective scanning and situationally appropriate selection of information in the perceptual, and executive attention pertains to a conscious examination of one’s reactions and responses to environmental events (Raz & Buhle, 2006; Robertson & Garavan, 2004). Mindfulness training is suggested to enhance alerting and orienting attention, as evidenced by research examining the brain. Experienced mindfulness meditators have been shown to display greater cortical thickening in areas of the right prefrontal cortex and right anterior insula that are considered to be linked to sustained attention and awareness, particularly of internal bodily states (Lazar et al., 2005). Jha, Krompinger, and Baime (2007) found that for participants with concentrative meditation experience, completing a month-long mindfulness meditation retreat was associated with the emergence and development of receptive attention, serving to strengthen alerting attention. Jha et al. (2007) also found that participants without meditation experience who participated in 8 weeks of MBSR training demonstrated an increased ability to orient their attention to the present moment. Research also suggests a connection between mindfulness and enhanced executive attention, as reflected in studies demonstrating increased behavioral regulation associated with mindfulness as well as studies showing enhanced prefrontal cortical inhibition of amygdala responses during affect labeling (Creswell et al., 2006). Furthermore, a modified version of MBSR for use with adolescents and adults with ADHD demonstrated improvements in executive attention (Zylowska et al., 2006). Improved efficiency of executive attention was also found in an experimental study comparing a relaxing training control group to five days of integrative meditation training that included mindfulness (Tang et al., 2007).

**Behavioral and Affective Control/Impulsivity.** ADHD may manifest in part or largely as impulsivity, which can be conceptualized as difficulties with self-control.
implicated mindfulness in both self-control of behavior and self-expression, suggesting potential utility of mindfulness training for individuals with ADHD, predominately Impulsive Type. Studies by Barnes, Brown, Krusemark, Campbell, and Rogge and Lakey et al. (2007) found that dispositional mindfulness was associated with increased dispositional self-control. Dispositional self-control was defined as the ability to override or change inner responses, and to interrupt and refrain from acting on undesired behavioral tendencies (Tangney, Baumesiter, & Boone, 2004). Studies examining DBT for patients with Borderline Personality Disorder demonstrate notable improvements in behavioral self-control, reflected in the reduction in self-mutilating behavior, drug abuse, and parasuicidal attempts (Bohus, Haaf, Stglimayr, Pohl, Bohme, & Linehan, 2000; Koons et al., 2001; Linehan, Armstrong, Suarez, Allman, & Heard, 1991; Linehan et al., 2002; Linehan et al., 1999; Turner, 2000; Verheul et al., 2003).

Acting impulsively as seen in some presentations of ADHD can be conceptually linked to “automatic behavior,” also known as habitual behavior. Wenk-Sormaz (2005) studied habitual behavior in two experimental studies and found that those receiving mindfulness training responded less automatically on tasks designed to elicit such a response compared to controls. Research has indicated that mindfulness may be effective in reducing various habitual destructive behaviors. DBT has demonstrated effectiveness in decreasing the frequency of binge eating among those with Binge Eating Disorder, as indicated by RCT studies using wait list controls (Safer, Tlech, & Agras, 2001; Telch, Agras, & Linehan, 2001). A RCT study comparing ACT to an active treatment comparison demonstrated ACT’s effectiveness in decreasing the drug use of opiate addicts (Hayes et al., 2004) and increasing the ability to quit smoking in nicotine dependent smokers (Gifford et al., 2004). Consistent with previous research, more recent studies have found mindfulness training is associated with increased ability to quit smoking (Davis,
Fleming, Bonus, & Baker, 2007), reductions in substance use (Bowen et al., 2006), and decreases in binge eating (Kristeller, Baer, & Quillian-Wolever, 2006). In contrast, Leigh, Bowen, and Marlatt (2005) found that among college students a mindful disposition was associated with more frequent binge drinking and smoking, thus contrary to previous findings regarding self-control and mindfulness.

Brain imaging research indicates that increased mindfulness is associated with an enhanced ability to control emotional reactions in the amygdale and dorsal anterior cingulated cortex through engagement of the prefrontal cortex, the part of the brain associated with attention, concentration, and emotional regulation (Creswell, Eisenberger, & Lieberman, 2008; Creswell, Way, Eisenberger, & Liberman, 2007).

**Self-regulation.** ADHD is often associated with difficulties in self-regulation. The ability to effectively self-regulate is thought to be critical for psychological well being, satisfying relationships, and task performance among many other components (Ryan & Deci, 2000). Brown and Ryan (2003) demonstrated that trait and state mindfulness were independently associated with increased self-directed self-regulation. Similarly, Smalley, Lo, Hale, Shrestha, and McGough (2009) found that participants higher in mindfulness were more self-directed. Furthermore, Levesque and Brown (2006) found that a more mindful disposition was associated with increased self-directed motivation for daily activities. Preliminary evidence suggests that mindfulness may help facilitate goal attainment. Mindfulness has been found to be potentially related to better academic and personal goal outcomes among college students, suggesting that the increased awareness associated with mindfulness facilitates increased attentiveness to one’s goals, which is considered necessary for behavior to be guided by such goal standards, according to self-awareness theory (Duval & Wicklund, 1972; Brown, Ryan, & Creswell, 2007).
Relationships. As discussed earlier, ADHD is associated with increased relationship difficulties. Preliminary research suggests that mindfulness may increase the quality of romantic relationships and communication in such relationships. Barnes, Brown, Krusemark, Campbell, and Rogge (2007) found that among non-distressed couples, higher trait mindfulness was associated with increased relationship satisfaction, an increased ability to respond constructively to relationship stress, and lower emotional stress responses to conflict. In a study adopting MBSR to a couples-based program called Mindfulness-Based-Relationship Enhancement (Carson, Carson, Gil, & Baucom, 2004), compared to wait list control couples participating in treatment reported significantly greater relationship satisfaction, autonomy, partner acceptance, and lower personal and relationship distress at posttest and 3-month follow up. Further, an association between mindfulness and aspects of emotional intelligence that are considered to be related to better social skills, perspective taking, cooperative response pattern, and marital satisfaction (Baer et al. 2004; 2006; Brown & Ryan, 2003). Mindfulness has also demonstrated an association with a felt sense of connectedness or interpersonal closeness (Brown & Kasser, 2005; Brown & Ryan, 2003; 2004b).

Working Memory. ADHD is associated with impairments in working memory, an element of executive functioning that research indicates is associated with increased mindfulness. In a recent study, Jha, Stanley, Kiyonaga, Woong, and Gelfand (2010) examined the effects of mindfulness training on working memory in two military cohorts prior to leaving for deployment to Iraq. Thirty-one participants engaged in the mindfulness-training program. Consistent with research on the effects of stress prior to deployment, the individuals in the military control condition \( (n = 17) \) demonstrated reductions in working memory, as well as individuals in the mindfulness-training program who spent little time engaging in mindfulness
exercises. However, individuals who spent more time engaging in mindfulness practices demonstrated modest improvements over time. Increased practice time was also associated with greater working memory.

**Mindfulness Based Interventions for ADHD.** There is a dearth of empirical studies to date examining mindfulness-based treatments for adult ADHD. Within the research that does exist, there is minimal consistency across studies regarding the particular treatment programs being examined for use with ADHD populations. Further, no studies have examined the effectiveness of a well-established mindfulness-based treatment such as MBSR for individuals with ADHD, though one study modified MBSR for an ADHD population. In considering the current state of research on mindfulness-based treatments for ADHD, the studies reviewed below examine treatments for ADHD that are all connected in some capacity to the essence of mindfulness, however many of the treatments differ from one another substantially and from already established mindfulness-based treatments.

Harrison, Manocha, and Rubia (2004) included 48 children in a within subjects, pre-posttest study design to examine the effects of Sahaja Yoga Mediation (SYM), as a family treatment method for children with ADHD based upon practices designed to achieve a state of thoughtful awareness. Treatment was six weeks and involved clinic sessions twice a week that included guided meditation and parents and children were asked to continue practice at home. Findings demonstrated improvements in core symptoms of ADHD; self-esteem including confidence, social abilities, and involvement; parent-child relationship quality as seen by a reduction in parent-child conflict interactions behavior; and improvements in approach to school and homework along with children’s report of increased ability to concentrate in school. A quasi wait-list control group was included, suggesting the SYM training was the agent of change.
Results indicated that improvements demonstrated were not related to whether a child was on ADHD medication or not. This study includes a plethora of limitations, some of which include small sample size, no formal control group (there was quasi control group), and high drop out rate. In addition, the significant findings were based upon parent rated questionnaires which presents the possibility that the significant results were due to parents wanting to portray themselves and their children in a certain light (Harrison et al., 2004).

Zylowska et al. (2008) conducted a within subject, pre-posttest design study with twenty-four adults and 8 adolescents with ADHD, the majority of whom were taking stimulant medications, to determine the effectiveness of a 8-week mindfulness training program termed Mindful Awareness Practices (MAPs) for ADHD. MAPs for ADHD is based upon existing models of mindfulness training (Kabat-Zinn, 1990; Segal et al., 2002), but adopted to meet to the needs of an ADHD population in various ways including the addition of a psychoeducation component about ADHD and a shorter time length required for sitting meditation. Results of this study demonstrated improvements in self-reported ADHD symptoms, enhanced attentional capabilities that are thought to be associated with inhibition and self-regulation, and decreases in symptoms of anxiety and depression. This last finding provides some preliminary evidence that individuals with ADHD who are higher on mindfulness-based attention are less likely to experience symptoms of anxiety and depression, as participating in a mindfulness-based training program designed to increase mindfulness also decreased the aforementioned symptoms in those with ADHD. Numerous limitations of this study include: small sample size; no control group; majority of participants were female, white, middle to upper socio-economic status; several participants had the diagnosis, “probably ADHD”; and indications that participants had higher
rates of comorbid mood disorders but higher overall functioning compared to the ADHD population.

Grosswald, Stixrud, Travis, and Bateh (2008) examined the effectiveness of a 3-month Transcendental Meditation (TM) program on 10 children with ADHD ages 11-14. The majority of participants were taking medication for ADHD and co-occurring symptoms but were still experiencing cognitive and psychosocial symptoms impacting them at school and home. TM meditation does not involve directing attention, but is spoken of as a technique of effortless transcending in which the active mind settling down to a silent yet fully awake state of awareness that is consciousness itself (Travis & Pearson, 2000). TM has recently been found to increase levels of mindfulness (Tanner et al., 2009; Shapiro et al., 2008). Findings demonstrated significant improvements on ADHD symptoms, stress, executive function, and reductions in anxiety. This last finding that participants demonstrated decreases in symptoms of anxiety, taken together with research indicating TM has been found to increase levels of mindfulness, suggests that those with ADHD who are higher in mindfulness are less likely to have symptoms of anxiety and depression. Limitations of this study include the small number of subjects, no control group, and lack of control for whether students were concurrently being treated with medication for their ADHD symptoms.

Abadi and Madgaonkar (2008) examined the effectiveness of a Yoga program for children with ADHD by conducting a pretest-posttest design study comparing a treatment group to a no treatment control group with 40 children meeting the ADHD diagnostic criteria. The Yoga program consisted of 2 sessions per week for 8 weeks and included the practice of yoga postures, breathing exercises, and relaxation consisted of 16 sessions. At posttest, individuals participating in the Yoga program demonstrated significantly greater improvements on the
ADHD symptoms of inattention and hyperactivity/impulsivity relative to the no treatment group. However, the largest difference between the Yoga group and no treatment group was seen in symptoms of hyperactivity and impulsivity. Methodological strengths of this study are that the number of participants exceeded the minimum required to confirm statistical significance, participants attended treatment consistently, there was little variability in age of participants in control group and treatment group, and the instructor was a trained yoga instructor. However, limitations include lack of follow up data to determine maintenance of treatment gains, neglect to address whether any participants were concurrently on medication for ADHD or comorbidities making it impossible to determine potential effects on outcome, and due to treatment being compared to a no treatment control group there is no way to know whether this treatment would be as effective as current, empirically supported treatments for ADHD.

Jensen and Kenny (2004) conducted a RCT with 11 participants examining the effectiveness of yoga in boys with ADHD who were stabilized on medication. Findings demonstrated improvements in emotional lability, restlessness, inattentiveness, and impulsivity and decreases in aggression, anger, and tension. Participants who attended the most sessions showed the greatest decreases in primary ADHD symptoms. Limitations were numerous including small sample size, insufficient statistical power used, variability in number of sessions attended, and heterogeneity of sample.

Moretti-Altuna (1987) conducted a study comparing mantra meditation and drug therapy in treating children with ADHD, using a teacher rating ADHD scale to measure outcomes (Moretti-Altuna, 1987). No statistical significant difference was found between the meditation and the drug group, indicating meditation was equally effective as medication in treating ADHD. In a second study that’s results never became published, Moretti-Altuna compared mantra
meditation to standard treatment without medication in children with ADHD, and findings
demonstrated no statistically significant difference between the two groups on the teacher rating
ADHD scale, nor on the distraction test. Thus, mantra meditation was found to be equally
effective as standard treatment without medication meditation in treating ADHD. Kratter (1993)
compared mantra meditation to relaxation training and to a wait list control with medication in a
sample of children with ADHD. Results found that only the meditation group improved in
selective attention abilities. However, both mantra meditation and relaxation training
significantly reduced impulsivity and improved behavior at home as reported by parents.

Due to the minimal research to date and various methodological limitations in many of
the studies that have been conducted, it is impossible to make conclusions regarding the
effectiveness of mindfulness-based treatment for adult ADHD. However, it appears clear that
this is an area worth exploring based upon preliminary findings and the apparent conceptual
basis for applying mindfulness treatment to ADHD, as well as research demonstrating that
increased mindfulness is inversely associated with many of the impairments and disorders that
frequently co-occur with ADHD.

Purpose of Present Study
While some individuals with ADHD are helped by medication and current psychotherapeutic interventions, a significant number of people continue to struggle with the impact of this disorder. Increased impairment and less responsivity to treatment are seen among those with ADHD and one or more comorbid disorders as a result of the cumulative impact of the primary ADHD symptoms and comorbid disorder(s). As evident from the aforementioned research, there is a strong need for research and development of alternative treatment options for adult ADHD, particularly targeting those with comorbidities. However, in order to develop the most effective treatments for individuals with ADHD and comorbid disorders, it is necessary to first understand the relationship between ADHD and frequent co-occurring conditions.

Considering the connections between the impairments involved in ADHD and the effects of a mindfulness practice or mindfulness training, it is rather surprising that although mindfulness-based interventions have been studied and incorporated into treatments for a myriad of physical and mental health issues, ADHD has been almost altogether ignored. To date, the majority of research on mindfulness involves introducing participants to mindfulness-based interventions in order to assess potential symptom changes and there is a paucity of research examining whether a mindful disposition mitigates the relationship between particular disorders and negative outcomes. In order to determine if mindfulness based interventions would be effective for disorders such as ADHD, such research is critical. Therefore, the purpose of this thesis is to assess whether mindfulness-based attention moderates the relationship between ADHD and three of the most common negative outcomes, depression, anxiety, and alcohol abuse, potentially providing further impetus for the development and utilization of mindfulness-based treatments for individuals facing not only ADHD, but also comorbid symptoms.

Statement of the Hypotheses
Hypothesis 1. ADHD was expected to be a significant predictor of anxiety, depression, alcohol abuse, and mindfulness. More specifically ADHD symptomatology was expected to evince a positive relationship with depression, anxiety, and alcohol abuse and a negative relationship with mindfulness.

Hypothesis 2. It was expected that mindfulness-based attention would moderate the relationship between ADHD symptoms and depression, such that ADHD symptoms would be more strongly related to symptoms of depression when mindfulness is low than when mindfulness is high.

Hypothesis 3. It was expected that mindfulness would moderate the relationship between ADHD symptoms and anxiety, such that ADHD symptoms would be more strongly related to symptoms of anxiety when mindfulness is low than when mindfulness is high.

Hypothesis 4. It was expected that mindfulness would moderate the relationship between ADHD symptoms and alcohol abuse, such that ADHD symptoms would be more strongly related to symptoms of alcohol abuse when mindfulness is low than when mindfulness is high.

Method
Participants

Participants were recruited from psychology undergraduate departments throughout the United States. Table 1 provides demographic data on the sample. A total of 214 students agreed to participate in the study and 198 students completed all five measures included in this study; of the 198 participants, 147 identified as being female and 51 identified as being male. Average participant age was 21 ($SD = 4$). The majority of participants identified as being Caucasian (71.2%), while 19.2% reported being Asian or Pacific Islander, 3.5% Latino or Hispanic, 3.5% Other, 1.5% African American or Black, and 1% American Indian or Alaskan Native.
**Demographic Information of the Sample (N = 198)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>n (%)</th>
<th>M (SD)</th>
<th>Median</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>198 (100.0)</td>
<td>21 (4)</td>
<td>20</td>
<td>16 - 46</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>51 (25.8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>147 (74.2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1 (.5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
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<tr>
<td>African-American/Black</td>
<td>3 (1.5)</td>
<td></td>
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<td></td>
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<tr>
<td>Asian/Pacific Islander</td>
<td>38 (19.2)</td>
<td></td>
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<tr>
<td>Latino/Hispanic</td>
<td>7 (3.5)</td>
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<tr>
<td>Native Amer/Alaska Native</td>
<td>2 (1)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>White/European Origin</td>
<td>141 (71.2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>7 (3.5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPA</td>
<td>189 (95.45)</td>
<td>3.35 (4)</td>
<td>20</td>
<td>1.4 – 4</td>
</tr>
</tbody>
</table>

**Measures**
Demographic Questionnaire. This instrument was developed by the principal investigator and faculty advisor. The questionnaire asks participants to provide the following demographic information: gender, age, GPA, and ethnicity (see Appendix A).

Adult ADHD Self-Report Scale (ASRS). The ASRS is an 18-item questionnaire in which respondents report, on a 5-point Likert-type scale (1 = very often to 5 = never), their frequency of recent DSM-IV Criterion A symptoms of adult ADHD. The ASRS includes a Screener with a subset of 6 questions. The unweighted six-question ASRS screener outperformed the unweighted 18-question ASRS in sensitivity, specificity, and total classification accuracy. Thus the ASRS Screener may be used to correctly identify adult cases of ADHD, while the ASRS Symptom Checklist may be used to fully assess patient’s ADHD symptoms and may be particularly advantageous after a positive identification of ADHD with the ASRS Screener (Kessler et al., 2005; Adler, 2006; Murphy & Adler, 2004) (Appendix B).

The Mindful Attention Awareness Scale (MAAS). The MAAS is a 15-item questionnaire in which respondents indicate, on a 6-point Likert-type scale (1 = almost always to 6 = almost never), their level of awareness and attention to present events and experiences. The MAAS items are designed to assess mindlessness and sample items include “I find it difficult to stay focused on what’s happening in the present” and “I do jobs or tasks automatically, without being aware of what I’m doing.” Responses are calculated into a mean rating score with higher scores corresponding to greater levels of mindfulness. The MAAS taps into a distinct type of attentional awareness that facilitates the self-regulation necessary for the development of positive states of mind. The MAAS is considered an instrument of dispositional mindfulness; however, it is also sensitive to state changes occurring through meditation experience. The MAAS shows a good range of internal consistency across a wide range of samples and excellent test re-test
reliability over a 1-month time period. The MAAS also exhibits adequate convergent validity; as expected it correlates negatively with measures of anxiety and depression and positively with measures of positive affect and self-esteem (Brown & Ryan, 2003; Michalak, Heidenreich, Meibert, & Schulte, 2008; Shapiro et al., 2008) (Appendix C).

**Center for Epidemiologic Studies Depression Scale (CES–D).** The CES-D is 20-item questionnaire measuring participants’ level of depressive symptoms. Items are rated based on the previous week and are scored on a 4 point Likert-type scale (0 = rarely or none of the time to 3 = most or all of the time). The CES-D contains four factors (Depressed Affect, Positive Affect, Somatic and Retarded Activity, and Interpersonal) designed to cover several domains of depressive symptoms. The CES-D has been correlated with self-report and clinician ratings of depressive symptoms. The CES-D has demonstrated good internal consistency, test-retest reliability have been established. Evidence of convergent validity has been established as the CES-D is highly correlated with other measures of depression. (Radloff, 1977; Devins et al., 1988; Gatz & Hurwiez, 1990; Wong, 2000) (Appendix D).

**Penn State Worry Questionnaire (PSWQ).** The PSWQ is a widely used 16-item self-report questionnaire that assesses an individual’s general tendency to worry excessively. It was designed specifically to assess the intensity and excessiveness of worry without reference to specific content of the worries. Each item presents a statement and is followed by a 5-point Likert-like response scale (1 = not at all typical of me to 5 = very typical of me), representing how typical the individual feels the statement is of him or her. The PSWQ is associated with good internal consistency, test-retest reliability, and construct validity. The PSWQ has been correlated with measures of worry and anxiety, attesting to its convergent validity. PSWQ scores have been found to be significantly higher among individuals with GAD than among any other

During the data cleaning process, it was discovered that only 15 of the 16 items were included in the PSWQ provided to participants in the questionnaire. The missing item consisted of the following statement: I worry about projects until they are done. Psychometric properties of the PSWQ in the present study should be considered with omission of this item in mind (Meyer, Miller, Metzger, & Borkovee, 1990; Borkovec & Costello, 1993; Brown, Antony, & Barlow, 1992; Davey, 1993; Meyer, Metzger, & Borkovec, 1990; Molina & Borkove, 1994) (Appendix E).

**Alcohol Use Disorders Identification Test (AUDIT).** The AUDIT was developed to screen for excessive drinking and in particular to help practitioners identify people who would benefit from reducing or ceasing drinking. The AUDIT helps practitioners identify whether the person has hazardous (or risky) drinking, harmful drinking, or alcohol dependence. As a screening test for alcohol problems, the AUDIT is sensitive and specific. In direct contrast with other self-report alcohol screening tests, the AUDIT exhibits validity at least equal to that of the other measure and in some instances higher. The AUDIT has demonstrated good internal consistency, test-retest reliability, and temporal reliability. The AUDIT has demonstrated good construct and criterion validity (Babor, Biddle-Higgins, Saunders, & Monteiro, 2001; Allen, Litten, Fertig, & Babor, 1997; Allen, Reinert, & Volk, 2001; Reinhart & Allen, 2007) (Appendix F).

Several briefer versions of the AUDIT have garnered research interest, particularly the AUDIT-C, which includes the first 3 items of the AUDIT that form the consumption factor. The AUDIT-C had demonstrated a test–retest reliability of 0.98 over a 3 to 4 week interval (Bergman
Among 4 studies examining the internal consistency of the AUDIT-C, all but 1 found reliability coefficients that were at an acceptable level, ranging from .69-.91 (Bergman and Kallmen, 2002; Gomez et al., 2005; Tsai et al., 2005; Rumpf et al., 2002). For detecting heavy drinking and/or active abuse or dependence, the AUDIT-C and the full AUDIT have been found to perform similarly (Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998). The AUDIT-C is thought to be more sensitive for detecting dependence than for lower intensity alcohol problems (Reinert & Allen, 2007). The AUDIT-C was used in the present study because the responses for the last 2 items of the AUDIT (9 & 10) were incorrectly entered into the survey monkey questionnaire given to participants, thus making the psychometric properties of the AUDIT unclear (Appendix G).

**Procedure**

The study was approved by Pacific University’s institutional review board prior to data collection. Directors of undergraduate psychology programs at 88 universities throughout the country were contacted via a brief email message providing information about the study and inviting their students to participate (see Appendix G for recruitment email; see Appendix H for list of universities). In recruiting participants at Pacific university, this researcher directly emailed Pacific University professors teaching undergraduate psychology courses about the present study and invited their students to participate. Those who were willing to allow their students to be recruited informed their students through class announcements or email messages. Participants completed an online self-administered questionnaire through Survey Monkey. Upon completion of all items, participants were given the option to either exit the survey or if interested, provide contact information to enter a drawing for a $25 gift card to Amazon.com. All participant data was coded numerically and stored separately from this optional contact.
information, which was the only identifying information gathered. IP addresses were not collected. Those who were enrolled in a course that offered extra credit for research participation received such credit.

Results
Data cleaning

Before analyzing the data, each variable’s compliance with univariate and multivariate assumptions was examined using SPSS 16.0.1 (SPSS Inc, 2007). Only those cases that completed all 5 measures (ASRS, MAAS, PSWQ, CES-D, AUDIT) were retained for analysis. 16 participants did not meet these criteria and were therefore removed from the data set used for analysis. This resulted in a final sample of 198. Upon inspection of the distribution of scores for each measure, it was discovered that the CES-D was slightly positively skewed and the AUDIT and PSWQ were slightly negatively kurtotic. Nevertheless, the aforementioned measures formed a normal distribution because their skewness and kurtosis coefficients did not exceed the cutoff value of +1 or -1 (Tabachnick & Fidell, 2001).

Distribution Characteristics and Descriptive Statistics

Descriptive statistics for each variable in the form of the mean, standard deviation, skewness and kurtosis is displayed in Table 2. The mean and the standard deviation for the MAAS (M = 3.77, SD = 0.74), PSWQ (M = 47.66, SD = 12.11), and CES-D (M = 17.38, SD = 10.20), are similar to those in normative samples: MAAS (M = 3.97, SD = 0.64; Brown & Ryan, 2003), PSWQ (M = 48.8, SD = 13.8; Meyer, 1990), and CES-D (M = 14.31, SD = 10.26; Orme, Reis, & Herz, 1986).
### Means, Standard Deviations, Skewness, and Kurtosis by Variable

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Skewness(SE)</th>
<th>Kurtosis(SE)</th>
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<td>.74</td>
<td>-.01(.17)</td>
<td>-.18(.34)</td>
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<td>CES-D</td>
<td>17.38</td>
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<td>.80(.17)</td>
<td>.46(.34)</td>
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<td>12.11</td>
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<tr>
<td>AUDIT-C</td>
<td>3.24</td>
<td>2.44</td>
<td>.30(.17)</td>
<td>-.84(.34)</td>
</tr>
</tbody>
</table>

**Note.** MAAS = Mindful Attention Awareness Scale, CES-D = Center for Epidemiologic Studies Depression Scale, PSWQ = Penn State Worry Questionnaire, ASRS = Adult ADHD Self Report Scale, AUDIT-C = Alcohol Use Disorders Identification Test Consumption Questions.
Table 3 lists the zero-order correlations between variables. ADHD was negatively associated with level of mindfulness ($r = -0.71, p < .001$) and positively associated with depression ($r = .48, p < .001$), anxiety ($r = .29, p < .001$), and alcohol abuse ($r = .17, p = .014$).

To examine whether mindfulness-based attention moderates the relationships between symptoms of ADHD and depression, anxiety, and alcohol use, three separate hierarchical multiple regression analyses were conducted. Results are summarized in Tables 4, 5, and 6.

**Analysis 1.** In a hierarchical multiple regression model predicting depression, ASRS was entered at step 1. MAAS was then entered at Step 2, followed by the addition of the ASRS x MAAS interaction at step 3. Consistent with hypothesis 1, ADHD symptoms were a significant predictor of depression symptomatology and accounted for 23% of the variance in depressive symptoms ($\Delta R^2 = 0.23, p = .017$). Consistent with hypothesis 1, mindfulness based attention was a significant predictor of depression symptomatology and accounted for an additional 8.7% of the variance in depressive symptoms ($\Delta R^2 = 0.087, p < .01$). Inconsistent with hypothesis 2, there was not a statistically significant interaction between mindfulness and ADHD symptoms in the prediction of depression ($\beta = 0.06, p = .326$).

**Analysis 2.** In a hierarchical multiple regression model predicting anxiety, ASRS was entered at step 1. MAAS was then entered at Step 2, followed by the addition of the ASRS x MAAS interaction at step 3. Consistent with hypothesis 1, ADHD symptoms were a significant predictor of anxiety, accounting for 8.2% of the variance in symptoms of anxiety ($\Delta R^2 = 0.082, p < .01$). However once mindfulness based attention was entered into the model, ADHD was no longer a significant predictor of anxiety symptoms ($\beta = .00, p = .996$). Mindfulness-based attention significantly predicted symptoms of anxiety ($\beta = -.40, p < .01$), accounting for 8.3% of the variance in anxiety symptoms ($\Delta R^2 = 0.083, p < .01$). Inconsistent with hypothesis 3, there
was not a statistically significant interaction between mindfulness and ADHD symptoms in the prediction of anxiety ($\beta = .06, p = .380$).

**Analysis 3.** In a hierarchical multiple regression model predicting alcohol consumption, ASRS was entered at step 1. MAAS was then entered at Step 2, followed by the addition of the ASRS x MAAS interaction at step 3. When the ASRS was the only variable entered into model, ADHD symptoms significantly predicted alcohol consumption, accounting for 3% of the variance in alcohol consumption ($\Delta R^2 = 0.03, p = .014$). However, once the MAAS was added to the model ADHD symptoms no longer significantly predicted alcohol consumption ($\beta = .19, p = .055$). Consistent with hypothesis 1, once the ASRS x MAAS interaction was added to the model at step 3 ADHD symptoms again significantly predicted alcohol consumption ($\beta = .21, p = .043$). Inconsistent with hypothesis 1, mindfulness based attention was not found to be a significant predictor of alcohol consumption anxiety ($\beta = .03, p = .760$). Inconsistent with hypothesis 4, there was not a statistically significant interaction between mindfulness and ADHD symptoms in the prediction of alcohol consumption ($\beta = 0.06, p = .443$).
Table 3

*Intercorrelations Between Variables*

<table>
<thead>
<tr>
<th></th>
<th>MAAS</th>
<th>ASRS</th>
<th>CES-D</th>
<th>PSWQ</th>
<th>AUDIT-C</th>
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<tbody>
<tr>
<td>MAAS</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASRS</td>
<td>- .71**</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CES-D</td>
<td>- .55**</td>
<td>.48**</td>
<td>--</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSWQ</td>
<td>- .41**</td>
<td>.29**</td>
<td>.51**</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>AUDIT-C</td>
<td>- .11</td>
<td>.17*</td>
<td>.04</td>
<td>-.02</td>
<td>--</td>
</tr>
</tbody>
</table>

*Note.* *Correlation is significant at the .05 level (2-tailed) **Correlation is significant at the 0.01 level (2-tailed). MAAS = Mindful Attention Awareness Scale, CES-D = Center for Epidemiologic Studies Depression Scale, PSWQ = Penn State Worry Questionnaire, ASRS = Adult ADHD Self Report Scale, AUDIT-C = Alcohol Use Disorders Identification Test alcohol consumption questions
Table 4

Regression Analysis Predicting Depression symptoms from ADHD and Mindfulness (N=198)

<table>
<thead>
<tr>
<th>Predictor</th>
<th>β</th>
<th>ΔR²</th>
<th>FΔ</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>.23</td>
<td>59.76</td>
<td>.017</td>
<td></td>
</tr>
<tr>
<td>ADHD</td>
<td>.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td>.09</td>
<td>25.13</td>
<td>&lt;.01</td>
<td></td>
</tr>
<tr>
<td>Mindfulness</td>
<td>-.41</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td>.00</td>
<td>.97</td>
<td>.326</td>
<td></td>
</tr>
<tr>
<td>ADHD x Mindfulness</td>
<td>.06</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: Standardized regression coefficients (β) are presented based on values at the final step*
Table 5

*Regression Analysis Predicting Anxiety symptoms from ADHD and Mindfulness (N=198)*

<table>
<thead>
<tr>
<th>Predictor</th>
<th>β</th>
<th>ΔR²</th>
<th>F∆</th>
<th>p</th>
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</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADHD</td>
<td>.01</td>
<td>.08</td>
<td>17.61</td>
<td>.885</td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mindfulness</td>
<td>-.40</td>
<td>.08</td>
<td>19.51</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Step 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADHD x Mindfulness</td>
<td>.06</td>
<td>.00</td>
<td>.77</td>
<td>.380</td>
</tr>
</tbody>
</table>

*Note: Standardized regression coefficients (β) are presented based on values at the final step*
Table 6

*Regression Analysis Predicting Alcohol Consumption from ADHD and Mindfulness (N=198)*

<table>
<thead>
<tr>
<th>Predictor</th>
<th>β</th>
<th>ΔR²</th>
<th>FΔ</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>.03</td>
<td>6.12</td>
<td>.043</td>
<td></td>
</tr>
<tr>
<td>ADHD</td>
<td>.21</td>
<td>.00</td>
<td>.07</td>
<td>.760</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>.00</td>
<td>.59</td>
<td>.443</td>
<td></td>
</tr>
<tr>
<td>Mindfulness</td>
<td>.03</td>
<td></td>
<td></td>
<td>.760</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADHD x Mindfulness</td>
<td>.06</td>
<td></td>
<td></td>
<td>.443</td>
</tr>
</tbody>
</table>

*Note:* Standardized regression coefficients (β) are presented based on values at the final step.
Discussion

The purpose of this thesis was four fold. First, it was expected that depression, anxiety, and alcohol consumption would show a positive relationship with ADHD, and that mindfulness would show a negative relationship with ADHD. Second, it was expected that mindfulness would moderate the relationship between ADHD and depression, such that ADHD would be more strongly related to depression when mindfulness is low than when mindfulness is high. Third, it was expected that mindfulness would moderate the relationship between ADHD and anxiety, such that ADHD would be more strongly related to anxiety when mindfulness is low than when mindfulness is high. Lastly, it was expected that mindfulness would moderate the relationship between ADHD symptoms and alcohol consumption, such that ADHD symptoms would be more strongly related to symptoms of alcohol abuse when mindfulness is low than when mindfulness is high.

As expected, a significant positive relationship was found between ADHD and depression. Students who reported more frequently experiencing symptoms of ADHD also endorsed more symptoms of depression. Previous research supports this finding, as numerous studies have found that ADHD is predictive of MDD. For example, a study by Biederman et al. (2010) found that girls with ADHD had significantly higher rates of MDD in young adulthood and Burke et al. (2005) demonstrated that ADHD was predictive of ODD and then later depression in a sample of adolescent boys. Various theories have been posited to explain this relationship, many of which suggest that symptoms of ADHD lead to impairments in social, academic, and/or occupational functioning that lead to increased struggles, thereby precipitating depression.

Also as expected a significant negative relationship was found between mindfulness and depression. Students who scored higher in dispositional mindfulness also endorsed less symptoms of depression. Supporting this inverse relationship between mindfulness and
depression are the numerous studies demonstrating an association between mindfulness training and decreases in depression (Kabat-Zinn, 1992; Kenny & Williams, 2007; Miller et al., 1995; Shapiro et al., 1998). Several mechanisms have been suggested for how mindfulness may facilitate decreased depressive symptomatology, one commonly proposed one being that increased mindfulness may be associated with reduced ruminative thinking common among people with MDD (Ramel, Goldin, Carmona, & McQuaid, 2004).

Further, a significant positive relationship was found between ADHD and anxiety when ADHD was the only predictor entered into the regression equation. Students who endorsed more frequently experiencing symptoms of ADHD also reported more symptoms of anxiety. However because ADHD and mindfulness share a substantial amount of variance, once mindfulness was added to the regression equation ADHD was no longer a significant predictor of anxiety. This finding was unexpected given that previous studies have linked ADHD with increased anxiety (Schatz & Rostain, 2006; Tannock, 2000). For example, a study by Safren et al. (2001) demonstrated that adults with GAD had increased rates of childhood ADHD and the onset of ADHD preceded GAD in all cases. One well-known explanation for this relationship is that the chronic failure experienced by children with ADHD leads to the development of anxiety (Safren et al., 2001). It’s possible that the current study did not find a significant relationship between ADHD and anxiety in part because the sample size was not sufficiently large enough to detect significance. It’s also a possibility that the lack of significance found between ADHD and anxiety in the present study was due to experimenter error that resulted in the omission of 1 of the 16 items on the PSWQ, potentially having a significant affect on the psychometrics properties of the measure. In addition, it is important to note that although much of the previous research is inconsistent with the current study’s finding that no significant relationship exists between mindfulness and anxiety, there has been research to the contrary. In a meta-analysis,
Toneatto and Nguyen (2007) found that MBSR had no significant effect on participants’ anxiety levels from pre to post treatment, providing some support for the present study’s results indicating no significant relationship between anxiety and ADHD.

A significant negative relationship was found between mindfulness and anxiety. Students who scored higher in dispositional mindfulness also reported experiencing less generalized worry. Some support for this finding can be gleaned from the results of previous studies measuring participants’ anxiety levels pre and post participation in a mindfulness training which have found an association between mindfulness training and reductions in anxiety (Kabat-Zinn, 1992; Miller et al., 1995; Shapiro et al., 1998). It has been suggested that sitting with anxiety instead of avoiding it decreases its emotional reactivity and ultimately extinguish the fear response and avoidance behaviors associated with anxiety (Barklow & Craske, 2000; Linehan, 1993a, 1993b). Focus on the present moment that’s inherent in increase mindfulness counteracts the tendency to focus on potential future events, which serves an avoidant function and is common among those with GAD, allows individuals to more readily notice what’s actually happening. In this way individuals are able to respond in a conscious way rather than in a habitual manner (Borkovec et al., 1999).

In addition, a significant positive relationship was found between ADHD and alcohol consumption both when ADHD was the only predictor entered into the regression equation and when the regression equation included ADHD, mindfulness, and their interaction. Students who reported more frequently experiencing symptoms of ADHD also endorsed more alcohol use. Support for this finding can be seen in a study by Weiss and Hechtman’s (1993) demonstrating an association between ADHD and increased rates of alcohol abuse or dependence, suggested those with ADHD may be more likely to use alcohol excessively. Previous research indicates that 35-71% of adult alcohol abusers have co-occurring ADHD that has persisted since
childhood (Goodwin, Schulsinger, Hermansen, Guze, & Winokur, 1975; Smith et al., 2002; Wilens, Spencer, & Biederman, 1995). There have been several conceptual links posited to explain the relationship between ADHD and alcohol use, for example it’s been suggested that alcohol may be used by some as a way to self-medicate distress related to the anxiety and/or depression associated with ADHD (Wilens, 1998). Another of the many suggested explanations for this relationship is that alcohol use may be a way to cope with the social difficulties experienced by many with ADHD (Smith et al., 2002). It should be noted that because ADHD and mindfulness share a substantial amount of variance, when the regression equation included only ADHD and mindfulness, ADHD and alcohol use did not demonstrate a significant relationship.

Furthermore, there was not a significant relationship found between mindfulness and alcohol use. This finding was unexpected given prior research demonstrating a significant relationship between mindfulness and alcohol use (Bowen et al., 2006, 2009; Fernandez, Wood, Stein, & Rossi, 2010; Leigh et al., 2005). For example, Bowen et al. (2006) found decreases in alcohol use among inmates following participating in a Vipassana (Buddhist mindfulness meditation) retreat. Another study found that participation in MBRP after an intense stabilization period was associated with less substance use and cravings, and greater increases in 2 subscales of the FFMQ at four month follow up compared to TAU group (Bowen et al., 2009). Conceptually there have been numerous ideas posited to explain this relationship, one being that excessive alcohol may be seen as avoidance of remaining in contact with one’s experience (avoidance), leading to craving and use (Marlatt & Chawla, 2007). Thus, increased mindfulness through meditation practice may allow increased opportunities to be present with one’s experience, including cravings, and facilitate the ability to pause instead of acting on the urge (Marlatt & Chawla, 2007). Significant relationships between mindfulness and alcohol use have
also been found in the opposite direction, for example 2 studies found that the Mindy/Body Awareness subscale of the FFMQ was associated with increased frequency of binge drinking among college students (Leigh et al., 2005, Leigh & Neighors, 2009). It’s been suggested that perhaps individuals with increased attunement to their bodily sensations would have a heightened experience of both aversive and pleasurable states, thus causing them to more readily seek ways to feel pleasure and escape uncomfortable or painful sensation, alcohol being one such way. Summarily, considering the research on both the significant positive and negative relationships between mindfulness and alcohol use it is surprising that the current study found no relationship between the two variables. It is possible this sample was not large enough to adequately capture a significant relationship between these two variables. In addition, the discrepancy between past research and the current study’s finding may have in part been due to differences in the measures used to assess mindfulness and alcohol use. While the present study used the MAAS and AUDIT-C, previous studies have measured mindfulness with either the Five Factor Mindfulness Questionnaire (FFMQ), Freiburg Mindfulness Inventory (FMI), or the Kentucky Inventory of Mindfulness Skills (KIMS) and have assessed alcohol use with the Daily Drinking Inventory (DDQ), The Alcohol Use Disorders Identification Test, or Timeline Followback (TLFB), among other measures.

A significant negative relationship was found between ADHD and mindfulness. Students who reported less frequently experiencing symptoms of ADHD also obtained scores corresponding to greater levels of mindfulness. This finding is consistent with Smalley et al. (2009) who found that ADHD is associated with lower trait mindfulness. Additional support for the present study’s finding of a relationship between mindfulness and ADHD can be seen in studies of individuals with ADHD who demonstrate significant symptom improvement following mindfulness training (Harrison et al., 2004; Zylowska et al., 2008; Grosswald et al., 2008).
Providing further support for the relationship between ADHD and mindfulness is research demonstrating that various impairments commonly associated with ADHD have improved following mindfulness training. For example, studies have shown improvements in executive, orienting, and alerting attention (Jha et al., 2007, Tang et al., 2007; Zylowska et al., 2006); behavioral regulation (Creswell et al., 2006); dispositional self-control (Barnes et al., 2007); emotional regulation (Creswell et al., 2009, 2007); and working memory (Jha et al., 2010) following mindfulness training, all common impairments in individuals with ADHD.

The second hypothesis, that mindfulness would moderate the relationship between ADHD and depression, failed to show significance. This is surprising, in part given that the present study found that independently both ADHD and mindfulness demonstrated a significant relationship with depression, and a significant relationship was found between ADHD and mindfulness. These findings taken together with prior studies demonstrating decreases in symptoms of depression following mindfulness training (Kabat-Zinn, 1992; Kenny & Williams, 2007; Miller et al., 1995; Shapiro et al., 1998), research demonstrating ADHD symptom improvement following mindfulness training (Harrison et al., 2004; Zylowska et al., 2008; Grosswald et al., 2008), and a study finding that following participation in mindfulness training those with ADHD demonstrated improvements in both symptoms of depression and ADHD (Zylowska et al., 2008) make it rather unexpected that mindfulness was not found to be a moderator between ADHD and depression in the present study. Perhaps a larger sample would find that having a disposition towards mindfulness serves as a protective factor between ADHD and depression.

The third hypothesis, that mindfulness would moderate the relationship between ADHD and anxiety, failed to show significance. Although the present study found a significant relationship between mindfulness and anxiety and ADHD and mindfulness, given that no
significant relationship was found between ADHD and anxiety, it is not surprising a significant interaction was not found. However, the lack of significance found between ADHD and anxiety was surprising in light of previous research (Biederman et al., 2010; Safren et al., 2001) and may have been due to the experimenter error that resulted in omission of 1 item from the PSWQ and potential subsequent effects on the psychometric properties of the measure. It seems that if this study were to be replicated without experimenter error the results may demonstrate that ADHD symptoms would be more strongly related to symptoms of anxiety when mindfulness was low than when mindfulness was high.

Lastly, the fourth hypothesis, that mindfulness would moderate the relationship between ADHD and alcohol consumption, failed to show significance. Although a significant relationship was found between ADHD and alcohol use and between mindfulness and ADHD, given that no significant relationship was found between mindfulness and alcohol use, it is not surprising a significant interaction was not found. As discussed previously, it was somewhat surprising that a significant relationship was not found between mindfulness and alcohol use when considering several past studies demonstrating decreases in alcohol use following mindfulness training (Bowen et al., 2006, 2009) and research indicating that increased mindfulness is associated with improvements in dispositional self-control (Barnes et al., 2007), as well as decreased habitual behavior (Wenk-Sormaz, 2005), both often associated with less substance use. Perhaps a larger sample would have found that having a disposition towards mindfulness would be a protective factor between ADHD and alcohol use.

This thesis adds to the research literature looking at the relationship between ADHD and depression, anxiety, and alcohol use, as well as the relationship between mindfulness and the aforementioned variables. Findings from this thesis also contribute to the small body of research examining mindfulness in relation to ADHD. This is the first study to examine whether
mindfulness acts as a moderator between ADHD and associated negative outcomes and therefore paves the way for potential replications of this study that improve upon the various methodological issues described below. It’s the hope that the addition of this study to the current state of research will inspire others to conduct studies examining potential relationships between mindfulness, ADHD, and perhaps common co-occurring impairments or symptoms in order to ultimately inform much needed alternative treatments for those with ADHD. In addition, hopefully this study will motivate researchers to conduct moderational studies given that the majority of research thus far on mindfulness has involved introducing participants to mindfulness-based interventions in order to assess potential symptom changes and there is a paucity of research examining whether a mindful disposition mitigates the relationship between particular disorders and negative outcomes.

This thesis has some notable limitations. First, all of the findings are based on self-report measures, which are subject to intentional and unintentional misrepresentation because of issues such as social desirability bias and inaccurate recall. Although steps were taken to reduce such error (such as assurances of confidentiality) it is impossible to rule out the possibility of self-report bias and/or distortion. Secondly, because data was gathered using a survey and a mindfulness-based intervention was not included, it is impossible to interpret causality from these findings. Third, researcher error is responsible for two significant limitations. The PSWQ included on the survey monkey questionnaire used to gather data did not include the last item (#16, “I worry about projects until they are done”) and it is unclear how this missing item affected the psychometrics of the measure and how central it is in order to tap into anxiety. Although the full PSWQ was still included in data analysis (there are not abbreviated versions and important variable in study), findings involving anxiety need to be considered with caution. In addition, the AUDIT included on the survey monkey questionnaire had errors in the response
options for items 9 and 10, which are two of the four items measuring harmful alcohol use. The AUDIT-C was the only researched and psychometrically sound abbreviated version of the AUDIT that did not involve items 9 and 10 and therefore was used in data analysis, however it only measures alcohol consumption, which was not the original construct of alcohol abuse. However, the initial goal was to measure alcohol abuse based upon previous research demonstrating a positive relationship between ADHD and alcohol abuse, as well as studies demonstrating an association between mindfulness training and substance abuse improvement.

Another limitation is that all participants were gathered from undergraduate psychology departments and being as such, this sample lacked ethnic diversity and had a larger proportion of women, thus limiting the generalizability of findings. Furthermore, it is possible that the use of different measures tapping into the constructs being studied, but based on different characteristics, would have resulted in a different pattern of findings.

In conclusion, the determination of whether mindfulness acts as a moderator between ADHD and symptoms of depression, anxiety, and depression remains unclear. This is the first study to examine this relationship and non-significant findings are considered in light of methodological limitations. The current study provide impetus for further research into the role of mindfulness as a moderator between ADHD and common co-occurring symptoms, particularly depression and anxiety, given that findings demonstrated ADHD and mindfulness have a significant negative correlation, ADHD is a significant predictor of depression, and mindfulness is a significant predictor of depression and anxiety. These results also add to the minimal amount of existing research providing evidence to suggest that mindfulness based interventions may be an effective alternative treatment for adult ADHD. Previous research suggests that for individuals with ADHD, mindfulness training is associated with decreases in the core ADHD symptoms
(Zylowska et al., 2008; Jha, Krompinger, & Baime, 2007), as well as anxiety and depression (Kabat-Zinn, 1992; Miller, Fletch, & Zinn, 1995; Shapiro et al., 1998; Carmody, Baser, Lykins, & Olendzki, 2009), and common deficits associated with ADHD (Zylowska et al., 2006; Tang et al., 2007). Interventions for individuals with ADHD that focus on enhancing mindfulness might help ameliorate the association between ADHD and depression.

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Appendix A

Demographic Questionnaire

1. Are you currently taking medication to treat ADHD symptoms? _____________
   If so:
   Which medication? _____________
   What dosage? _____________
   How long have been taking this medication? _____________
   Do you find this medication helpful? _____________

2. Please indicate your gender.
3. What is your current age? ______________

4. Are you employed? ______________ If so, what is your occupation? ______________

5. What is your GPA (if a student)? ______

6. Which group best describes your ethnicity?
   ___African American or Black
   ___Asian or Pacific Islander
   ___Latino or Hispanic
   ___American Indian or Alaskan Native
   ___White or of European Origin
   ___Other (write in)_____________________

Appendix B

Adult ADHD Self-Report Scale Symptom Checklist

Please answer the questions below, rating yourself on each of the criteria shown using the scale on the right side of the page. As you answer each question, place an X in the box that best describes how you have felt and conducted yourself over the past 6 months.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<tbody>
<tr>
<td>Very Often</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Often</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rarely</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Never</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

1. How often do you have trouble wrapping up the final details of a project, once the challenging parts have been done?
2. How often do you have difficulty getting things in order when you have to do a task that requires organization?

3. How often do you have problems remembering appointments or obligations?

4. When you have a task that requires a lot of thought, how often do you avoid or delay getting started?

5. How often do you fidget or squirm with your hands or feet when you have to sit down for a long time?

6. How often do you feel overly active and compelled to do things, like you were driven by a motor?

7. How often do you make careless mistakes when you have to work on a boring or difficult project?

8. How often do you have difficulty keeping your attention when you are doing boring or repetitive work?

9. How often do you have difficulty concentrating on what people say to you, even when they are speaking to you directly?

10. How often do you misplace or have difficulty finding things at home or at work?

11. How often are you distracted by activity or noise around you?

12. How often do you leave your seat in meetings or other situations in which you are expected to remain seated?

13. How often do you feel restless or fidgety?

14. How often do you have difficulty unwinding and relaxing when you have time to yourself?

15. How often do you find yourself talking too much when you are in social situations?

16. When you’re in a conversation, how often do you find yourself finishing the sentences of the people you are talking to, before they can finish them themselves?

17. How often do you have difficulty waiting your turn in situations when turn taking is required?

18. How often do you interrupt others when they are busy?
Appendix C

Mindful Attention Awareness Scale

Below is a collection of statements about your everyday experience. Using the 1–6 scale below, please indicate how frequently or infrequently you currently have each experience. Please answer according to what really reflects your experience rather than what you think your experience should be.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Almost Always</td>
<td>Very Frequently</td>
<td>Somewhat Frequently</td>
<td>Somewhat Infrequently</td>
<td>Very Infrequently</td>
<td>Almost Never</td>
</tr>
</tbody>
</table>
1. I could be experiencing some emotion and not be conscious of it until some time later.

2. I break or spill things because of carelessness, not paying attention, or thinking of something else.

3. I find it difficult to stay focused on what’s happening in the present.

4. I tend to walk quickly to get where I’m going without paying attention to what I experience along the way.

5. I tend not to notice feelings of physical tension or discomfort until they really grab my attention.

6. I forget a person’s name almost as soon as I’ve been told it for the first time.

7. It seems I am “running on automatic” without much awareness of what I’m doing.

8. I rush through activities without being really attentive to them.

9. I get so focused on the goal I want to achieve that I lose touch with what I am doing right now to get there.

10. I do jobs or tasks automatically, without being aware of what I’m doing.

11. I find myself listening to someone with one ear, doing something else at the same time.

12. I drive places on “automatic pilot” and then wonder why I went there.

13. I find myself preoccupied with the future or the past.


15. I snack without being aware that I’m eating.
Appendix D

Center for Epidemiologic Studies Depression Scale

Below is a list of some of the ways you may have felt or behaved. Using the 1-4 scale below, please indicate how often you have felt this way during the past week.

*During the past week…*

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Rarely or none of the time (less than 1 day)</td>
<td>Some or a little of the time (1-2 days)</td>
<td>Occasionally or a moderate amount of time (3-4 days)</td>
<td>Most or all of the time (5-7 days)</td>
</tr>
</tbody>
</table>
1. I was bothered by things that usually don't bother me.
2. I did not feel like eating; my appetite was poor.
3. I felt that I could not shake off the blues even with help from my family or friends.
4. I felt that I was just as good as other people.
5. I had trouble keeping my mind on what I was doing.
6. I felt depressed.
7. I felt that everything I did was an effort.
8. I felt hopeful about the future.
9. I thought my life had been a failure.
10. I felt fearful.
11. My sleep was restless.
12. I was happy.
13. I talked less than usual.
15. People were unfriendly.
16. I enjoyed life.
17. I had crying spells.
18. I felt sad.
19. I felt that people disliked me.
20. I could not get "going."
Appendix E

Penn State Worry Questionnaire

Enter the number that best describes how typical or characteristic each item is of you, putting the number next to the item or rate each of the following statements on a scale of 1 (“not at all typical of me”) to 5 (“very typical of me”).

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</thead>
<tbody>
<tr>
<td>Not at all typical of me</td>
<td>Somewhat typical</td>
<td>Very typical of me</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. If I don’t have enough time to do everything, I’ll worry about it.
2. My worries overwhelm me.
3. I do not tend to worry about things.
4. Many situations make me worry.
5. I know I shouldn’t worry about things, but I just can’t help it.
6. When I am under pressure I worry a lot.
7. I am always worrying about something.
8. I find it easy to dismiss worrisome thoughts.
9. As soon as I finish one task, I start to worry about everything else I have to do.
10. I never worry about anything.
11. When there is nothing more I can do about a concern, I don’t worry about it anymore.
12. I’ve been a worrier all of my life.
13. I notice that I have been worrying about things.
14. Once I start worrying, I can’t stop.
15. I worry all the time.

Appendix F
Alcohol Use Disorder Identification Test

Below are questions about your use of alcoholic beverages during this past year (examples- beer, wine, vodka, etc). Place an X in one box that best describes your answer to each question.

1. How often do you have a drink containing alcohol?
   (0) Never (1) Monthly or less (2) Two to four times a month (3) Two to three times a week (4) Four or more times a week

2. How many drinks containing alcohol do you have on a typical when you are drinking?
   (0) 1 or 2 (1) 3 or 4 (2) 5 or 6 (3) 7 or 9 (4) 10 or more
3. How often do you have six or more drinks on one occasion?
   (0) Never (1) Less than monthly (2) Monthly (3) Weekly (4) Daily or almost daily

4. How often during the last year have you found that you were not able to stop drinking once you had started?
   (0) Never (1) Less than monthly (2) Monthly (3) Weekly (4) Daily or almost daily

5. How often during the last year have you failed to do what was normally expected from you because of drinking?
   (0) Never (1) Less than monthly (2) Monthly (3) Weekly (4) Daily or almost daily

6. How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?
   (0) Never (1) Less than monthly (2) Monthly (3) Weekly (4) Daily or almost daily

7. How often during the last year have you had a feeling of guilt or remorse after drinking?
   (0) Never (1) Less than monthly (2) Monthly (3) Weekly (4) Daily or almost daily

8. How often during the last year have you been unable to remember what happened the night before because you had been drinking?
   (0) Never (1) Less than monthly (2) Monthly (3) Weekly (4) Daily or almost daily

9. Have you or someone else been injured as a result of your drinking?
   (0) No (2) Yes, but not in the last year (4) Yes, during the last year

10. Has a relative, friend, doctor, or other health worker been concerned about your drinking or suggested that you should cut down?
    (0) No (2) Yes, but not in the last year (4) Yes, during the last year

Appendix G

AUDIT-C

1. How often do you have a drink containing alcohol?
   (0) Never (1) Monthly or less (2) Two to four times a month (3) Two to three times a week (4) Four or more times a week

2. How many drinks containing alcohol do you have on a typical when you are drinking?
   (0) 1 or 2 (1) 3 or 4 (2) 5 or 6 (3) 7 or 9 (4) 10 or more

3. How often do you have six or more drinks on one occasion?
   (0) Never (1) Less than monthly (2) Monthly (3) Weekly (4) Daily or almost daily