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Roger Sideman
Nature's Ritalin? The Effects of Green
Spaces on Symptoms of Attention-
Deficit/Hyperactivity Disorder

ABSTRACT

This qualitative study explored the effects of exposure to natural green spaces on symptoms of Attention-deficit/hyperactivity disorder (ADHD) among diagnosed college students. Six students from three universities in the San Francisco Bay Area were interviewed regarding the impact of experiences in urban green spaces and wilderness on their perceived attentional functioning, stress, and mood.

The study sought to: 1) contribute to the growing base of literature and research on Attention Restoration Theory (ART); 2) offer a potential non-pharmacological alternative treatment for ADHD; and 3) further develop within the field of social work an understanding of the natural environment as it relates to behavioral and mental health.

The findings demonstrated that activities in outdoor settings helped reduce attention-deficit symptoms. All participants noted that time spent in nature often leads to a reduction of tension and helps redirect attention from tangential and racing thoughts to a greater state of mental relaxation. Suggestions for further research were given, as well as recommendations that the natural environment become a routine part of the assessment and treatment.

NATURE'S RITALIN?
THE EFFECTS OF GREEN SPACES
ON SYMPTOMS OF ATTENTION-DEFICIT/HYPERACTIVITY DISORDER

A project based upon an independent investigation,
submitted in partial fulfillment of the requirements
for the degree of Master of Social Work.

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2012

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CHAPTER I

Introduction

Attention-deficit/hyperactivity disorder (ADHD) is the most common and fastest growing childhood behavioral disorder in the United States, now diagnosed among 9.5% of all children aged 4 to 17 (American Academy of Pediatrics, 2000; Pastor, 2008). The diagnosis of ADHD exacts a serious toll on those who are afflicted and often persists into adulthood. The availability of ADHD treatment medications, such as Ritalin and Adderall, has sparked a national debate about overmedicating what has been dubbed “generation Rx” (Aikins, 2011). Current ADHD treatments with stimulants are controversial and far from ideal (National Institutes of Health, 1998). Stimulant medications are amphetamine-based, habit forming, and classified by the U.S. Drug Enforcement Agency as Schedule II controlled substances with a high risk for abuse. According to the National Institutes of Health (1998), stimulants offer only limited, short-term relief from symptoms, and often involve serious side effects. Some individuals simply do not like the way stimulants make them feel. Additionally, stimulant drugs are useful during portions of the day, but are not a practical option for the evening hours before bedtime.

There is more to the treatment of ADHD than just medication. Mainstream treatments include behavioral and lifestyle modifications as well as psychotherapy. Examples of strategies that address distractibility include exercising, creating schedules, and restructuring time to break down overwhelming tasks into more manageable pieces. The combination of medication, education, and behavioral therapies has helped treat symptoms of ADHD. Nevertheless,

between 2003 and 2007, rates of diagnosis increased an average of 5.5% per year (Pastor, 2008). With the rate of diagnoses rising despite widespread efforts to treat ADHD, it is important to seek alternative treatment options. Surprisingly, the physical environment has not been given significant consideration as a potential source of support for children with ADHD (Taylor, Kuo, & Sullivan, 2011). However, an emerging area of research considers the effects of the physical environment on individuals who live with ADHD. By exploring the psychological benefits of exposure to the outdoors, researchers are able to investigate if nature can help to minimize the symptoms of ADHD.

To further address the lack of consideration of the physical environment on individuals with ADHD, the purpose of this study was to provide a richer set of descriptive data than had been previously collected regarding the interaction between nature and attention disorders. The research question was: How does exposure to natural green space effect symptoms of ADHD? Through individual and group interviews with college students diagnosed with ADHD, this study sought to examine how exposure to natural green spaces, such as beaches or city parks, affects their symptoms. For this study, green space was defined as any outdoor location such as a city park or beach, as well as more remote wilderness areas. Symptoms of ADHD include: impairment in the ability to concentrate on mental tasks, to delay expression of inappropriate emotions or actions, and to inhibit distractions.

The research question is relevant to social work practice and behavioral therapies because it provides another way to look at ADHD. There is an apparent dearth of literature attending to the natural environment in social work despite the field's origins as a response to problems associated with rising urbanization and industrialization. In addition to the goal of making a contribution to the literature through an empirical investigation, it is my hope that the findings

from this study can convey the need for social workers' interventions to include the consideration of a client's time spent in natural environments. It is hoped that social workers can apply the findings to further scrutinize current methods of treatment. This study lends greater attention to the natural environment's relevance in social work in various domains including child development, education policy, and clinical practice. On a macro-level, current global challenges call on social workers to collaborate with environmental and social activists and participate in community-led responses to the natural environment's role in psychosocial functioning.

CHAPTER II

Literature Review

To gain an understanding of the relationship between the natural environment and attention, this review of literature examines research pertaining to ADHD and the potential for nature to alleviate the disorder's debilitating problems of impulsiveness, inattentiveness, and hyperactivity. The first section of this chapter presents a historical foundation for the growing body of research in this field. The second section describes the theory explaining the mechanisms by which nature helps improve attention. The third section broadens the discussion to encompass larger questions about the interplay between mental health and one's physical environment. The fourth section investigates the research studies that most directly address this study's central question regarding nature exposure and ADHD symptoms. Subsequent sections include an exploration of the rise of ADHD diagnoses and treatments with stimulants, critiques of ADHD as a social construction, and this study's relevance to social work.

History

In the early 1970s, psychologists Kaplan and Kaplan of the University of Michigan began a nine-year study sponsored by the U.S. Forest Service that followed teenage participants on an outdoor education program in the wilderness for up to two weeks (as cited in Clay, 2001). During or after these treks, participants reported experiencing a sense of peace. Participants also reported that simply being in nature was more restorative than the physically challenging activities, such as rock climbing, for which outdoor education programs are mainly known.

Prolonged focused attention on tasks, such as rock climbing, led to what the researchers call “directed attention fatigue,” marked by impulsive behavior, agitation, irritation and inability to concentrate (Kaplan & Kaplan, 1989). However, allowing participants to relax into a space of what researchers call "effortless attention" reduced stress and allowed them to think more clearly (Kaplan & Kaplan, 1989). Effortless attention includes the experience of passively reflecting on things such as clouds moving across the sky, leaves rustling in a breeze, or water bubbling over rocks in a stream. The positive effect, which researchers Kaplan and Kaplan called “the restorative environment,” was much greater than was originally expected (Louv, 2005). The original study by Kaplan and Kaplan (1989) marked the beginning of a series of investigations that have influenced a generation of environmental psychologists.

Today, researchers are exploring nature's impact on people's mental functioning, social relationships and even physical well-being (Louv, 2005). While environmental psychologists are putting new research into practice by working with interior designers, architects, and city planners to create psychologically healthy buildings and cities, they are also developing new treatments in areas of psychological and behavioral health. With their theory of attention restoration, Kaplan and Kaplan paved the way for this innovative thread of research nearly two decades after the aforementioned backpacker study (Louv, 2005).

Attention Restoration Theory

Attention Restoration Theory (ART) is an outgrowth of the early research on behavioral changes experienced while in the outdoors. The theory asserts that people demonstrate improved concentration after spending time in nature, or even looking at scenes of nature. ART has implications for ADHD because it proposes that natural environments can assist attention functioning (Kaplan & Kaplan, 1989). For the purposes of this discussion, attention is defined as

an individual's ability to concentrate on mental tasks, to delay expression of inappropriate emotions or actions, and to inhibit distractions.

ART categorizes individuals as falling into four states of attention: 1) directed attention; 2) directed attention fatigue; 3) effortless attention; and 4) restored attention. Tasks that require sustained mental effort draw upon "directed attention." Directed attention supports purposeful mental activity, such as clear perceptions, ongoing train of thought, and problem-solving (Cimprich, 2007). Individuals must expend effort to achieve focus, to delay expression of inappropriate emotions or actions, and to inhibit distractions. Any prolonged mental effort leads to directed attention fatigue (Kaplan, 2005). Attention may be "restored" by changing to a different kind of task that uses different parts of the brain, as in the familiar idiom "a change is as good as a rest."

In contrast to directed attention, involuntary attention is easy and does not require effort (Taylor, Kuo, & Sullivan, 2001). Involuntary attention is often described as a "state of fascination." James (1962) suggests that certain elements in the environment draw on our involuntary attention: "strange things, moving things, wild animals, bright things, pretty things, words, blows, blood, etc." (p. 231). Reliance upon involuntary attention can be useful for the recovery of fatigued directed attention. Kaplan (1995) proposes that stimuli and environments that draw primarily on involuntary attention give directed attention a chance to rest. From a neurological perspective, involuntary attention is a spontaneous "inhibitory" response to sensory or intellectual stimuli based on interest (Cimprich, 2007). Directed attention fatigue occurs because the brain's inhibitory mechanisms become fatigued by competing stimuli (Louv, 2005).

Kaplan (1995) explains these phenomena in the context of evolutionary biology:

It might seem peculiar that a mechanism so intimately involved with human effectiveness would be so susceptible to fatigue. Yet, in evolutionary perspective, this apparent limitation might have been quite reasonable. To be able to pay attention by choice to one particular thing for a long period of time would make one vulnerable to surprises. Being vigilant, being alert to one's surroundings may have been far more important than the capacity for long and intense concentration (p. 170).

Directed attention fatigue overlaps with many of the symptoms of ADHD (Cimprich, 2007). According to Kaplan, Kaplan, and Ryan (1998), an environment that allows for fascination is restorative in that it helps adults and children relieve stress and recover from directed attention fatigue. The authors argue that nature is the most effective source of restorative relief. According to Stephen Kaplan, "Directed attention fatigues people through overuse. If you can find an environment where the attention is automatic, you allow directed attention to rest. And that means an environment that is strong on fascination" (as cited in Clay, 2001, para. 8).

Researchers say ART helps replenish attention because it "is characterized by novel and diverse objects" (Ryan et al., 2010, p. 159). Kaplan, Kaplan and Ryan (1998) developed ART, which has been supported by numerous subsequent independent studies, based on their initial study of 1,200 corporate and state office workers. Office workers with a view of trees, bushes or large lawns, experienced significantly less frustration and more work enthusiasm than employees without views. According to Kaplan, Kaplan, and Ryan (1998), merely having a window allowed office workers to better concentrate on mental tasks. Their study demonstrated that a person

does not have to live in the wilderness to benefit from nature. Office windows allow exposure to "novel and diverse objects," which is sufficient for the creation of a restorative environment.

ART demonstrates how prolonged focus on a particular task can strain an individual's ability to pay attention. In addition to causing mental fatigue, the absence of more spontaneous, automatic thinking also causes stress. The overlap between stress and attention will be examined in the following section.

Stress Versus Attention

Related to ART is Stress Recovery Theory (SRT), which posits that "exposure to nature induces positive emotions in people which suppresses negative emotions and can, therefore, help recovery and may even help [to build] a buffer against future negative emotional experiences" (Gatersleben, 2008, p. 30). Both ART and SRT demonstrate that a person can reap psychological benefits from nature including the ability to work better and think more clearly. According to Kaplan (1995), a restorative environment confers benefits to both stress and attention fatigue that are distinct from each other but also closely related.

Hancock and Warms (1989) consider how attention fatigue and stress work together to aggravate symptoms of ADHD. They assert that attention is key to psychological functioning because of its central role in selectively filtering large amounts of information, and in managing behavior. Stress occurs when mental tasks "place demands on an individual's attention resources, eliciting a physiological response" (Hancock & Warms, 1989, p. 23).

The interaction between stress and attention is demonstrated in a series of studies by Gary Evans (Evans & Johnson, 2000; Evans & Maxwell, 1997). In a study of first- and second-graders, Evans and Maxwell (1997) found that children attending a school where airplanes frequently flew overhead scored 20% lower on word recognition tests that required sustained

attention, than students at schools without serious noise disruption. The tests were administered in a quiet environment, showing that chronic noise exposure has lasting effects. These effects included "changes indicative of chronic stress, elevated annoyance and irritation, motivational deficits related to learned helplessness, and alterations in cognitive development and reading achievement" (Evans & Maxwell, 1997, para. 36). In another study, Evans and Johnson (2000) found that clerical workers exposed to conversation and other mild office noise showed higher stress levels and gave up on performance tests faster than those with quiet offices.

The presented studies document how noise impacts stress levels. The studies pose the question of how other environmental stressors such as traffic, pollution and crowding impact mental health. Anecdotally, cities would seem more stressful than more placid, rural environments. The phenomenon is also well documented: People who live in cities are more likely to have mood or anxiety disorders (21% and 39%, respectively) and are twice as likely to have schizophrenia (Harmon, 2011). With more than half of the world's population currently living in urban areas, and about 70% projected to be city dwellers by 2050, determining how to lessen the mental toll of city life could become a major public policy issue. Pruessne refers to this as "a cause for concern" (as cited in Harmon, 2011). However, the biological bases for these urban and rural differences have historically been unclear.

New research shows that living in urban environments impacts specific regions of the brain that deal with stress responses. In their study, Lederbogen et al. (2011) observed the brains of 32 healthy German adults via an fMRI machine while the participants underwent social stress tests. During the tests, the participants were asked to answer difficult math questions (with a success rate hovering around 25 to 40%) under time pressure, all while getting negative verbal responses. Lederbogen et al. (2011) also found that two areas of the brain looked substantially

different in the urban dwellers. Current urbanites had higher activation in their amygdala, which is linked to response to threats. Urbanites who had lived in cities during the first 15 years of their life showed changes in the pregenual anterior cingulate cortex, which is charged with moderating amygdala and other stress regulation. For Lederbogen's study, cities were defined as municipalities with more than 100,000 people and towns as areas with a population of greater than 10,000 (to contrast with more sparsely populated rural areas). One limitation of the study is that it shows only the correlation between city living and the shifts in stress processing, rather than cities as a source of the diseases themselves. Despite the lack of causation between nature and stress reduction, there remains strong evidence of nature's benefits. According to psychologist Peter Kahn of University of Washington (as cited in Louv, 2005), more than a hundred studies reveal that stress reduction is one of the primary benefits of nature experiences.

In the previously discussed studies in this section, researchers have demonstrated non-biological causes of stress as well as the interplay of stress and attention functioning. However, one limitation is that they do not explore in specific detail the impacts of the physical environment. A clearer understanding of stress and attention in relation to the physical environment would have positive implications for nature restoration therapies and the emerging field known as ecopsychology (Louv, 2005). Another limitation of the previous studies is that while they underscore the significant effects of one's physical environment on one's behavior, most do not specifically address attention deficits. The studies discussed in the following section and subsection look specifically at the interplay between nature and attention.

A Closer Look at Nature and ADHD Research

If ART applies to everyone, regardless of age, as Kaplan and Kaplan (1989) posit, it is important to focus on school-aged children who exhibit symptoms of ADHD because the

disorder is best treated at an early age. In a frequently cited research study in this area, Faber Taylor and Kuo (2008a) found that green outdoor spaces foster creative play in children, improve their access to positive adult interaction, and relieve symptoms of ADHD. In their survey of families of children with ADHD aged 7 to 12, Taylor and Kuo asked parents or guardians to identify after-school and weekend activities that either improved or impaired their children's functioning. Activities were coded as “green” (e.g. camping), “not green” (e.g. watching TV), or “ambiguous” (e.g. rollerblading). Taylor and Kuo (2009) concluded that greenery in a child’s everyday environment, even views of the outdoors through a window, specifically reduced attention-deficit symptoms. While outdoor activities were helpful, settings with trees and grass were found to be the most beneficial. Taylor and Kuo also found that greenery settings and views may have a larger effect for girls, aged six to nine, including increased concentration, decreased impulsivity, and longer delay of gratification (Louv, 2005).

In a provocative follow-up study, Faber Taylor and Kuo (2008b) contended that standard stimulant medication was no more effective at increasing concentration for a child with ADHD than a walk in nature. The study involved taking children on walks in three different settings — one especially "green" and two less "green." Everything about the walks was kept as similar as possible. Before and after the walks, researchers measured each child’s attention using a standard neurocognitive test called Digit Span Backwards. In this test, researchers read a series of numbers aloud, and the child recites them backwards. This is a test in which practice does not improve one's score. The sample size was relatively small, 17 children, because, according to Faber Taylor, the logistics "were a nightmare to coordinate” (as cited in Larson, 2008, p. 2). Kuo said it was difficult to control many of the variables of the study. Kuo started with an unusually large sample, but eliminated all of the factors that would undermine the study's

validity. These factors included days with poor weather, children arriving late, or arriving medicated. When Kuo and her researchers eliminated those participants, they reported that they were left with a relatively "pure" sample (Larson, 2008). Kuo also emphasized that this study involved an objective test of attention, and not just of children's or parents' impressions of attention, as in previous studies (Larson, 2008). The finding that an alternative treatment, such as a dose of nature, could replace medication altogether is striking. Faber Taylor and Kuo (2008a) posit that nature therapy can be a possible third course of treatment, applied either with medication, with behavioral therapy, or on its own.

In addition to looking critically at the study methods, it is also useful to place a study like Taylor and Kuo's attention test in a larger context of how ADHD is understood. For example, if data showing that the cause of ADHD involves abnormalities with the neurochemical dopamine — research that validates the wide use of stimulant medications — then it would be difficult to say that nature is an adequate substitute (Sikström & Söderlund, 2007). However, according to the National Institutes of Health (NIH) (1998), the status quo must be reassessed. The NIH issued a consensus statement arguing that treatment with medication is fraught with uncertainty:

There are wide variations in the use of psychostimulants across communities and physicians, suggesting no consensus regarding which ADHD patients should be treated with psychostimulants. These problems point to the need for improved assessment, treatment, and follow-up of patients with ADHD, and a more consistent set of diagnostic procedures and practice guidelines is of utmost importance. (p. 1)

A critical look has been taken at how studies are conducted and whether it is realistic to see nature as a substitute for medication. It is also important to look at which populations are being sampled and whether they are representative of general populations. For example, Wells

and Evans (2003) compared children's cognitive functioning before and after they moved from lower to higher quality housing adjacent to natural green spaces. The authors found that profound differences emerged in the children's attention capacities even when the effect of housing quality was taken into account. However, this study has limitations. For instance, even when differences in the quality of housing are taken into account, one might interpret the children's improved attention to unspecified factors associated with living in better housing, such as more space, less noise and therefore less stress. Despite these concerns, Taylor and Kuo (2009) have studied nature and attention in both inner-city public housing and in middle class settings, showing that wealthier children also perform better in green settings. This section explored current research on the effect of nature on ADHD symptomatology. The following section examines the possible consequences of nature deprivation on childhood development and ADHD.

"Nature Deficit Disorder" and the Role of Nature in Human Development

In *Last Child in the Woods: Saving Our Children from Nature Deficit Disorder*, Louv (2005) considers the role of nature in the developmental lives of children and adults. Louv spent 10 years traveling around the United States reporting and speaking to parents and children, in both rural and urban areas, about their experiences in nature. In his book, Louv argues that children are spending less time outdoors, resulting in a wide range of behavioral problems. Louv (2005) coined the lay term "nature-deficit disorder" to illustrate the lives of many children today, as well as to identify a potential factor in attention problems. Even though this is a lay interpretation, mental health professionals are now exploring Louv's ideas. The book has also resonated with the general public.

Louv claims that causes for the phenomenon include parental fears, restricted access to natural areas, and the lure of the electronic screens. He argues that sensationalist media coverage and paranoid parents have literally "scared children straight out of the woods and fields," (Louv, 2005, p. 76) while promoting a litigious culture of fear that favors "safe" regimented sports over imaginative play. Louv notes several important points that connect children's health, physical activity, and nature. He relates the documented fact that lack of physical activity leads to depression in children (Louv, 2005). Additionally, Louv points out that although organized sports have increased at a record rate, the trend has not stopped childhood obesity rates from increasing rapidly. Louv (2005) also notes the relationship between obesity and TV watching time. He argues that organized sports (which are not always outdoors) provide less variety and freedom of time for "physical and emotional exercise" (p. 47) than playing in nature.

Louv points to a variety of studies showing nature exposure as a supplemental, and sometimes replacement, therapy for ADHD (Louv, 2005). Louv (2005) argues that in this "information age," television, the Internet, and new gadgets that draw more of people's time and attention are dulling our senses, creativity, and knowledge. He also points out that changes in the use of technology are part of a bigger picture of social/environmental change that includes the recent movement from rural to urban living (Louv, 2005). Until the 1950s, agriculture was a part of most American families' lifestyles giving children opportunities for chores and "unregimented play...steeped in nature" (Louv, 2005, p. 101). He believes the lifestyle change is part of the reason for increases in attention and hyperactivity problems. In recognizing the trends, Kellert (as cited in Louv, 2005) argues that humans have an instinctive liking for nature, a theory known as the "biophilia hypothesis."

Kellert advocates for taking steps to spend more time outdoors in, for example, outdoor education or by sending young children to "forest schools," where classes are held outdoors year-round regardless of the weather. Forest schools emphasize the arts and the natural world, with no formal academic curriculum until first grade. Waldorf teacher Sigrid D'Aleo advocates for forest schools because, over the years, she and other teachers had seen students at their best when outdoors. According to D'Aleo (as cited in Leyden, 2009), "Their large motor skills developed, they worked out their social issues in a better way, they had more imaginative play. Children's senses are so overtaxed in these modern times, so here, it is very healthy for them." Louv (2005) notes that educators around the nation have observed similar results. Louv's synthesis of conversations with hundreds of teachers is consistent with ART, which emphasizes the benefits of involuntary attention. Louv states, "[Nature] helps us use all our senses at the same time. It seems to be the optimum state of learning, when everything is coming at us in lots of different ways" (as cited in Leyden, 2009, para. 12).

In *Last Child in the Woods*, Louv argues that children have suffered from diminished time outside. In his follow-up book, *The Nature Principle: Human restoration and the end of nature-deficit disorder*, Louv (2011) delivered a call to action for adults. He described the restorative power of nature as having an impact on mental health, creativity, businesses, and communities. Louv argues that the need for nature among adults has never been so pressing. The following section compliments Louv's arguments by looking at the persistence of childhood ADHD in adult populations.

ADHD in Adulthood

As was reflected in the second edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-II), the dominant view among mental health professionals was that children and

teens diagnosed with ADHD would eventually and invariably "grow out of it" (Russell, 2010). According to Russell (2010), there is only a recent acknowledgement that clinically significant symptoms of ADHD persist into the adulthood years for a majority of affected children. Research conducted over the past decade has provided important information on the persistence and prevalence of adult ADHD (Goodwin, 2011; Russell, 2010). Despite differences across studies in the definition of persistence, some research has found that ADHD persists into adulthood for at least 50% of childhood cases (Russell, 2010). Other studies have showed that persistence of symptoms causing some form of functional impairment falls in the range of 65% to 75% (Russell, 2010).

ADHD medication use is highest in children aged 6 to 12, which researchers attribute to the fact that ADHD symptoms often become problematic when children enter school and struggle to stay focused (Goodwin, 2011). The increase in medication use among adolescents may be among children who were able to get by through elementary school, but then struggled in higher grades. Goodwin (2011) recognizes that the disorder does not disappear with puberty. Goodwin (2011) explains how ADHD symptoms manifest over the course of a child's development:

In adolescents, the symptoms become more evident because the academic demands increase. The tasks they have to do in school become more complex. Even though they were able to get by in elementary school and middle school, in high school they become more impaired because their attention is not what it should be. (para. 20)

The persistence of ADHD from childhood into adulthood is especially troublesome when looking at rates of diagnoses. By all measures, rates of diagnoses have reached epidemic proportions. Over the past 15 years, a massive wave of children with ADHD has entered higher

education and the nation's workforce. The consequences of this phenomenon remain unclear. What is clear, however, is that stimulants are riding the wave of diagnoses. Stimulants have become a mainstay in the treatment regimens for millions of children and adults. The following section charts recent trends in ADHD diagnoses and treatment with stimulants.

Explosion of Diagnoses and Treatment with Stimulants

In the early 1990s, approximately 900,000 youth in the United States were diagnosed with ADHD. At that time, few children were treated with stimulants (Mayes & Erkulwater, 2008). By the mid-to late 1990s, between 3 and 4 million children were diagnosed with the disorder, the majority of whom were using stimulants as treatment. According to Mayes and Erkulwater (2008), the rapid increase in childhood ADHD diagnoses and stimulant-based treatment stemmed primarily from a confluence of trends (clinical, economic, educational, political), an alignment of incentives (among clinicians, educators, policymakers, health insurers, the pharmaceutical industry), and the rapid growth in scientific knowledge about ADHD and stimulants that converged in the early 1990s.

The main reason for the rise of ADHD diagnoses was the splitting of ADHD into two categories, with or without hyperactivity. This occurred in 1980 when the DSM-III was published (Mayes & Erkulwater, 2008). Previously, only symptoms of hyperactivity disorder were included. Although many children with attention deficits have trouble with restlessness, not all have severe enough hyperactivity that it would be brought to the attention of health professionals. The broadening of the diagnosis to include those with non-hyperactive symptoms opened up a large new population of children to receive a diagnosis of ADHD. Interestingly, the rate of ADHD prescriptions remains significantly lower in the Western states compared to other parts of the nation (Goodwin, 2011). Researchers are not sure why geography influences

prescription rates. Two possible reasons could be increased parental resistance to pharmacological treatments for their children, and school systems that handle children with ADHD differently (2011, para. 24).

The rise in diagnoses and medication is not exclusive to ADHD. According to a 2011 report by Medco Health Solutions, a pharmacy-benefits management company, 1 in 5 American adults was using some type of mental health medication, a 22% increase over the past decade (as cited in Allday, 2011). In 2011, The Society for Humanistic Psychology posted an online petition citing what they saw as a broadening of the definition of mental health disorders, which in turn, would lead to overtreatment with drugs. The petition garnered 7,000 signatures from people against many of the suggested DSM revisions. According to Allday (2011), since the last DSM update, research has increasingly pointed to biological causes for a wide variety of mental health conditions. In response, treatment has turned toward pharmacological answers. "Drugs are being used to solve mental health problems that aren't problems at all," Allday (2011, para. 11) reported.

Critiques of ADHD as a Social Construction

In looking at how societal forces, rather than biological changes, have contributed to today's prevalence of pharmacological treatment, critics have raised the question about the extent to which ADHD is truly a biological disorder. Much public debate has centered on the mainstream narrative that the stimulant phenomenon is a triumph of medical science successfully battling a neurological disorder. Critics contend that ADHD has largely been "socially constructed" as a response to nonmedical problems, such as classroom environment, underperforming schools, increased academic demands and expectations, and greater family disruption (Timimi & Taylor, 2004).

Changes in family structure feed one common argument against the medical model of ADHD. This argument asserts that while the traits that define ADHD exist and may be measurable, these traits lie within the spectrum of normal healthy human behavior and are not dysfunctional. Timimi (2004), a leading critic of ADHD as a valid diagnosis, argues that a Western style of anxious parenting with high expectations for achievement creates stress on families. Timimi's research suggests non-biological causes for children exhibiting symptoms of ADHD. Timimi also notes that higher divorce and poverty rates have coincided with the rise of preschool and day-care for tens of millions of children. According to Tamimi (2004), parents who feel they have failed in their parenting responsibilities can use the ADHD label to absolve guilt and self blame.

Controversy has long raged over whether ADHD is a real disorder. However, a three-year study by the National Institute of Mental Health (NIMH) (as cited in Whitaker, 2010) showed that when it comes to ADHD treatment, the controversy is moot. Even if ADHD is real, stimulants do not provide long-term help, according to the results of this study. According to NIMH (as cited in Whitaker, 2010), medication helped children behave better in the short-term. However, in the long term, those on medication saw their core symptoms — impulsiveness, inattentiveness, and hyperactivity — actually worsen.

ADHD as product of the physical environment. In *Crazy Like Us: The Globalization of the American Psyche*, Watters (2011) argues that "the underlying disquiet in the children of our time" is more important than the questionably legitimate symptom cluster of ADHD. Watters asks, "What are the currents in our time that might be causing an upwelling of psychopathology? How about the decline in exercise and the domestication — the penning — of children in ever smaller and more elaborately padded artificial environments" (2011, para. 6).

Watters does not discuss nature explicitly, but he calls important attention to the mental health establishment's neglect of the built environment and how it influences behavior.

Mayes and Erkulwater (2008) place the rapid rise of ADHD in a historical context. The authors suggest that as societies have become more urbanized and moved indoors, modern children have not been able to adjust to crowded, artificial classroom environments:

These changes occurred after decades of major adjustments in the expectations of and roles for children. Modern American society has moved very quickly — in terms of human evolution — from centuries of child labor and minimal organized schooling to universal schooling and educational systems with upward 25 or even 30 students per teacher and eight-to 10-hour days for five-year-olds. (para. 46)

Dramatic changes in schooling and the physical environment must be considered when attempting to understand student behavior. These factors that influence a student's behavior, but which are beyond his or her control, are often overlooked when treatment options are explored. There exists a bias in treatment that ADHD is purely biological. According to Whitaker (2010), although the public often hears that research has shown that ADHD is a 'brain disease,' (p. 220) the truth is that the etiology remains unknown. By stepping away from the lens of biology as the main driver of human behavior, the dominant treatment approach of medicating children must be reconsidered. The following section examines nonmedical forms of treatment and the need for more research.

Future Research

Despite encouraging studies, the existing body of research on the impact of nature experiences on attention disorders and child development is in its infancy and is easily

challenged (Louv, 2005). Recently, Taylor and Kuo (2009) conceded that the current body of research is lacking, but that there never has been a greater need for it:

For many of us, intuition emphatically asserts that nature is good for children. Beyond these intuitions, there are also well-reasoned theoretical arguments as to why humans in general — and therefore children — might have an inborn need for contact with nature. With the advent of video games, computers and the Internet, children today have more reasons to stay indoors than ever, and busy parents may be inadvertently modeling for the children a life in which nature activities have low priority. The question of nature's role in healthy childhood development is increasingly urgent. (p. 136)

While important positive effects have been achieved with medications, many adults with ADHD continue to need additional therapeutic support to improve their daily functioning. Adjunctive treatments are most often pursued in combination with medications. In many cases, however, adjunctive treatments are carried out without medications.

Although the number of nonpharmacological treatments is growing, they lack a foundation in research. According to Russell (2010), the need is pressing for adjunctive treatments for adults with ADHD. Many individuals with mild to moderate symptoms of ADHD in relatively uncomplicated situations (e.g., no comorbid psychiatric or learning problems, good interpersonal support, stable job) initially choose to pursue alternatives to medication (Russell, 2010). Furthermore, a significant number of adults who are prescribed medications require additional help to develop and implement effective coping strategies or to address complicating issues. These issues include severity of ADHD symptoms, the presence of comorbid psychiatric diagnoses (such as substance abuse), and severity of impairment in different life domains (Russell, 2010). Finally, some individuals may not be able to take medications for ADHD

because of side effects or medical contraindications. Other individuals simply decline medication and search for alternative treatment approaches. In summary, demand is high for alternatives to stimulant medication as the single treatment for ADHD. New research grounded in alternative approaches, including nature-based interventions, will serve to legitimize and expand upon existing therapeutic treatments.

Relevance to Social Work

Attention to the physical environment and its impact on mental health and general well-being has deep roots in social work. The field of social work developed to help urban dwellers struggling with problems that accompanied the rapid urbanization and industrialization of the 19th century. Many of the problems people experienced were associated with hazardous urban conditions and economic instability. The attempts of early aid workers to address these problems evolved into two modes of response, directly assisting individuals and addressing environmental conditions (Ehrenreich, 1985). The rise in social problems that came with urban immigration and industrialization, such as inadequate housing, workplace hazards, and health issues, resulted in recognition that environmental forces and conditions play a vital role in people's ability to thrive (Ehrenreich, 1985). Some of the founders of social work were sensitive to issues related to the physical environment, "but these perspectives diminished as the field professionalized and focused on psychosocial elements" (Ritchie, 2010, p. 40).

More recently, many social workers appear to be open to, and interested in, including the natural environment in the scope of the profession (Shaw, 2006). The National Association of Social Workers (NASW) (2009) has begun to address the natural environment in a policy statement that recognizes social work's role in addressing environmental justice and

environmental racism in particular. In this context, if it is proven that access to nature correlates with attention deficits and overall mental health, then access to nature is an issue of justice.

To some limited degree, social work has included therapeutic elements of the natural environment through, for example, wilderness therapy and horticultural therapy. The natural environment is receiving attention in other areas of theory and practice. For example, Shaw's (2006) adapted ecosystems theory emphasizes awareness of the natural environment in social work client assessments. Psychology research is also producing a growing body of findings on how exposure to the natural environment affects people emotionally, cognitively, and physiologically. Wilderness experiences have been of particular interest for potential therapeutic outcomes with a variety of populations. Finally, since at least the 1990s, the term ecopsychology has identified a gathering of scholars, practitioners, activists, and others from a variety of fields whose interest is the relationship between psychological health and the health of the natural environment. Ecopsychology certification programs, which advance the understanding of psychology in the context of nature, have been created at mainstream institutions such as the Lewis and Clark Graduate School of Counseling.

Conclusion

There is a growing foundation of empirical research and theoretical base upon which to develop a deeper understanding of how nature interacts with attention and symptoms of ADHD. The questions and controversy over the traditional forms of ADHD treatment currently in use, as well as the rates of diagnosis showing that these interventions are not making inroads, demonstrate the need for new approaches to ADHD treatment. Researchers (Kuo & Taylor, 2008a; Taylor & Kuo, 2009; Taylor, Kuo & Sullivan, 2001) believe that their findings point to nature therapy as a potential third course of treatment, applied either in concert with medication

and/or behavioral therapy, or on its own. For example, behavioral therapy and nature therapy, if used collaboratively, have the potential to teach students how to visualize positive experiences in nature when they need a calming tool.

This literature review has examined the rise of ADHD and the corresponding need for diversified treatments. The emerging focus on exposure to natural settings illuminates one pathway with potential for alleviating ADHD symptoms. Early evidence showed psychological benefits from experiences in wilderness, and subsequent studies showed that less intense exposures to a natural environment, such as a view from a window, also improved attention and focus. More focused studies of the effects of natural settings on cognitive functioning consistently showed improved attention and mental restoration. ART, the theory underlying much of this research, argues that common after-school and weekend activities may be widely effective in reducing symptoms, both in short-term relief from hyperactivity and distractibility, and long-term ability to cope with stress and adversity. Further research and development of interventions with the natural environment has enormous potential to improve daily functioning for millions of people with ADHD. The next chapter will lay out this research study's design and method, recruitment process, limitations, biases, and plan for data analysis.

CHAPTER III

Methodology

The phenomenon of rising ADHD rates warrants new understandings of the problem and new approaches to treatment. This study provides data that explores significant aspects of attention problems in a relatively new context, the effect of the physical environment. The purpose of this study was to explore the ways in which exposure to outdoor green spaces affects symptoms of ADHD among diagnosed college-aged (18-25) students. This qualitative study sought to explore and describe what changes occur in natural settings in regards to attention, focus and stress, and whether nature experiences help young adults cope with these problems. The study employed a flexible-methods research design with open-ended interview questions to gather the narrative data (Rubin & Babbie, 2010, p. 230). Participants were asked to describe their observations regarding the effects of various activities and settings on their symptoms. Their answers offered a detailed and nuanced picture of the ADHD symptomatology in the context of physical environment. The research question was: How does exposure to natural green space effect symptoms of ADHD? This chapter presents the methods of research used in this study and will describe the sample selection, data collection, and data analysis procedures.

Sample

The study population was comprised of young adults who live locally in the San Francisco Bay Area, home to many colleges and universities. The final sample consisted of six college students with ADHD ranging in age from 19 to 23. Four students were interviewed

individually and two were interviewed together in a focus group. Two participants were students at San Francisco State; three were at University of California at Berkeley; and one was at University of San Francisco. Four participants were male and two were female. Although I did not explicitly gather data on race, two of the six participants identified themselves as first-generation Americans; one identified as being of Mexican heritage and the other identified as being of Chinese heritage. A third participant mentioned that his family originated from India.

This particular population was chosen because the group straddles the line between two distinct populations: adults and students. Typically, these groups are studied in isolation of each other. Most studies of ADHD look at K-12 students (Louv, 2005). Additionally, the study aimed to produce a uniquely rich set of data related to school performance because college students are generally more self-reflective, self-aware and articulate when compared to younger students.

Inclusion criteria for participation were the following: 1) a clinical diagnosis of ADHD provided by a licensed mental health professional; 2) aged 18 to 25; 3) enrolled in a college program and taking at least 12 credits as undergraduates or 9 credits as graduate level students (the FAFSA requirements for full-time status); 4) access to a computer and email; and 5) ability to speak and understand English. Exclusion criteria included: 1) a current pregnancy; 2) people who identified as having co-occurring psychiatric disorders; or 3) substance dependence.

Diversity in the sample was critical for obtaining representative results therefore participants were solicited from a diverse selection of schools, including city and community colleges, and private institutions. This was achievable at campuses such as University of California at Berkeley, where Caucasian students comprise one-third of the student body (University of California, 2011). To further optimize diversity in findings, the study was open to

participants regardless of gender, sexual orientation, race, ethnicity, socio-economic status, physical status, and religion.

The study relied on nonprobability sampling rather than random selection. Random selection would have been difficult because lists of college students with ADHD do not exist and it is infeasible to obtain a list of clusters to sample from a campus resource center. Because the study relied on available subjects, the recruitment process employed availability sampling techniques. The high number of young adults in the San Francisco Bay Area, which is home to many colleges and universities, added to the feasibility of the study.

Methodological biases, reliability of measurement and validity were observed and noted throughout the process. Participants were solicited via online advertisements, which could have been a sampling limitation since all participants were required to have access to a computer. This limitation was mitigated by posting flyers in various locations on campuses. Because participants were self-selected, they may have been more prone to spend extended periods of time in nature. A proclivity or easier access to spend time in nature could have skewed results by lending a stronger voice to those with higher socioeconomic status.

There was likely to be a certain amount of personal bias involved because I designed the research questions. My own bias toward valuing experiences in nature may have influenced the research and conflicted with the findings. My personal biases were tempered by showing caution in how interview questions were phrased. Awareness was given to subtle signals that I inadvertently showed, such as nodding with approval. Lastly, participants may have been influenced by my voice, intonation, inflection, and manner.

The sample number of participants ($n = 6$) was small and may have hindered generalizability. The sample is a small representation of students with ADHD and only offered a

glimpse into the views of a select few. Although the small sample favors idiosyncratic insights into nature experiences, many of the emergent themes were common and relevant to many other people with ADHD. The location and timing of the data collection also posed potential limitations regarding generalizability. The data was collected from a limited geographic region, the Northern California coast. Thus, the question arises, whether these findings apply to children living in regions without green trees, public parks, the beach, and nearby mountains. For example, students in urban areas without easy access to such places may not receive equal benefits from contact with nature settings. Furthermore, the study was conducted within a short period of time during the Winter season. This raises another question of whether the nature-attention relationship is still as strong during the winter months, when the outdoors are less hospitable and when students have more attentional demands.

Lastly, although there was a risk that students diagnosed earlier in life no longer display symptoms of ADHD, the most current research stated in the literature review shows that the assumption that children "grow out" of their diagnoses in adulthood is incorrect (Russell, 2010). In fact, significant symptoms of ADHD persist in more than half, and possibly closer to 80 percent, of children diagnosed with ADHD.

Data Collection

The data gathered for this study included both qualitative and quantitative data. The quantitative data included age and sex, and was used to describe the participants. Data was collected through individual interviews or focus groups depending on the number of volunteers at a given school. If two or more people responded, a group was organized. In all, six individual interviews were conducted including four individual and one group interview consisting of two participants. Procedures to protect the rights and privacy of participants were outlined in a

proposal of this study and presented to the Human Subject Review Board (HSRB) at Smith College School for Social Work before data collection began (see Appendix A). Prior to each interview, individual or group, participants were given an informed consent form to review and sign (see Appendices B.1 and B.2) that described their participation in the study and their rights as human subjects, as well as any potential risks or benefits of participation. I will keep these documents in a secured environment separate from the data for three years after the conclusion of the study as mandated by Federal regulations.

Participants were recruited by the posting of flyers on public bulletin boards at four San Francisco Bay Area campuses: Stanford University, San Francisco State, University of San Francisco, and University of California at Berkeley (see Appendix C). Following prior approval via email, flyers were distributed in staff mailboxes at the Schwab Learning Center, which serves students with ADHD. In addition to flyering, advertisements consisting of a digital image of the flyer were posted on Craigslist and Facebook (see Appendix C).

After potential participants responded via email, there was a 5-10 minute screening phone call to verify eligibility to participate (see Appendix D). At this point, participants were informed that the study would examine their experiences indoors vs. outdoors and how those experiences may or may not affect attention. Once eligibility was determined, interviews were scheduled. Whether a focus group or individual interview was held depended on the response rate at a particular location. Participants were notified during the screening phone call that if fewer than two people from a school were available to meet in a focus group, individual interviews would need to be arranged. Participants were notified in a follow-up phone call whether an individual interview would be held. Individual interviews took place inside campus library study rooms in order to maximize confidentiality.

Individual interviews lasted approximately 30 minutes and the group lasted approximately 45 minutes. Interviews consisted of open-ended and close-ended questions, as well as follow-up discussion questions. As mentioned above, at the outset of the meeting participants were required to read and sign two informed consent forms. They kept one copy and returned the other to me. Participants were told that informed consent helps ensure that they understood the possible risks and benefits inherent to participation. They were informed that participation was voluntary, that they could refuse to answer any interview questions and could withdraw from the study at any time without penalty. Withdrawal would result in all materials related to them being destroyed immediately. Participants were informed that it would be possible to withdraw from the study by April 15, 2012.

The interview began with questions (see Appendix E) asking participants to explore themes related to how outdoor experiences or indoor conditions such as natural lighting and fresh air affect their ability to concentrate, hyperactivity and stress levels. I took notes during the interviews, which were recorded by audiotape. I transcribed the tapes myself. The transcripts, notes and audiotape were kept in a secure location.

The study was designed to minimize risk from participation. As mentioned above, data was not collected until approval was received from the Smith College School for Social Work Human Subjects Review Committee (See Appendix F). One interview was conducted over the phone and the remaining interviews were conducted in-person, in a public space, that was semi-private to protect confidentiality. Confidentiality was limited for focus group participants because others in the group heard others' answers, and it was not possible to control what was revealed outside of the group. Additionally, participants may have experienced some psychological discomfort in divulging how ADHD has affected their lives. Participants were

given a list of community referral resources before exiting (see Appendix G). Benefit to participants included the potential to gain new insights about how time spent outdoors, or previously unnoticed changes to their physical surroundings, affects their ability to concentrate. Participants may have benefitted from the knowledge that their stories are helpful to others and to broadening awareness of ADHD. They were informed that the information they shared would be passed on to other social work students to use for future research. An additional benefit of participation was an iTunes gift card worth \$10 and a pizza dinner. Participants were told they would be rewarded even if they failed to complete the interview.

All identifying information was held in confidence. All informed consent forms and audio files will be stored in a locked file cabinet and kept secure for three years as required by Federal regulations. After that time, both the Informed Consent and the audio files will be destroyed. If materials are needed beyond three years, they will be kept secure, and destroyed when they are no longer needed.

Data Analysis

Data was analyzed by conducting a content theme analysis that involved looking for common patterns and themes among participants in three major categories: 1) influences of nature on attention; 2) experiences in nature; and 3) experiences with ADHD and medication. Afterwards, using descriptive statistics to summarize observations, I organized and compared themes and concepts that emerged in the process and noted how frequently participants mentioned these themes. I used block quotes to illustrate themes, such as experiences of nature, experiences of ADHD and stimulant medication, and influences of nature on attention.

The openness of a content theme analysis, more inspired by exploration and inquiry than confirmation of a hypothesis, invited unexpected findings. Throughout the interview process,

certain issues emerged among several respondents that were not specifically or directly targeted in the interview guide. Therefore, attempts were made to attend to variations and contradictions in findings, which are presented in the following chapter. Interpretations of the findings and implications are noted in the following chapters.

CHAPTER IV

Findings

This chapter contains the findings from interviews conducted with six San Francisco Bay Area college students with ADHD. The students were asked a series of questions designed to elicit perspectives on how experiences in natural settings affect their symptoms of ADHD, energy, stress, and mood. Participants described experiences as they relate to their ability to perform in school, as well as other areas of their lives. All of the respondents reported positive changes in levels of stress levels and ability to focus. Many participants also elaborated on their experiences in nature including topics that were not specifically addressed in the questions, including their personal definitions of nature, the effects of stimulant medications, childhood stories, and religious or spiritual ways of relating to nature.

Participants' experiences with ADHD were diverse. Several participants ($n = 3$) were diagnosed in early childhood and have been treated with stimulant medication ever since. Others were diagnosed within the last year, upon entry to college. All of the participants expressed a proclivity to spend time in nature, most commonly through walks or hikes. However, experiences in nature also varied widely across the sample. Some were veteran backpackers, snowboarders, or hikers, while others interacted with nature in the form of a short hike or day at the beach.

In order to clarify any ambiguity regarding individual perceptions of how nature experiences may be defined, all participants were given definitions and examples of nature

activities, based on previous research (see Appendix C). Despite my efforts to maintain a constant definition of nature and nature activities, the findings in this chapter reflect each participant's idiosyncratic relationship with the natural world.

The findings are organized into three main sections. The first section is based on responses to the study's key question regarding how nature experiences directly affect attentional problems and hyperactivity. The second section examines participants' experiences in nature, including the mechanisms by which ADHD symptoms improve. The third and final section focuses on how an ADHD diagnosis and a regimen of stimulant medication affect participants in the context of the study's main questions about nature.

Influences of Nature on Attention

Interviewees were asked to think about their ability to focus or pay attention after spending at least several hours engaged in unfocused activities outdoors. They were also asked about changes in levels of stress, energy, ability to relax, mood, and behavior. All six noted without hesitation that changes occurred. However, their reports of the quality or intensity of those changes varied. All six respondents noted that time spent in nature usually leads to a reduction of tension and helps redirect attention from tangential and racing thoughts to a greater state of mental relaxation. While a vast majority of respondents ($n = 5$) said that nature experiences improved attentional function, one respondent denied that nature had such an affect. Most ($n = 4$) described feeling recharged or energized in nature. One participant disagreed. He said that the positive shift in energy was simply a product of physical activity, a response that cannot be attributed to being outdoors per se.

Stress and redirected attention. Several interviewees said that nature relieved stress, in part, because it redirected their attention away from school. For example, when asked if he

noticed any changes in his stress levels when taking breaks outdoors, Ethan said he feels more calm and carries less tension. “Being outdoors just helps take my mind off things,” he said. “I’m generally just more at ease. Stress goes down.” Ethan cautioned against overgeneralizations about nature and stress. He said that when he was in a heightened state of extreme stress or anxiety, that “it’s really hard to get over that, to be more present” no matter how soothing a hike in nature might be.

Courtney remembered being “destructive” in high school, a result of feeling confined by indoor spaces. This caused her to act out in school and at home. She described an experience of profound relaxation during and after camping trips:

Being in school all day I would get that nervous kind of anxious energy and it comes out in destructive ways at times, or most of the time. And so I would be destructive toward things or people and then get in trouble for it. But I would find that when I would go on camping trips or just even weekend trips, like to the lake or something, I’m not as destructive, and I am more patient and calmer with people and with situations that, if I had spent all day indoors, would be stressful or just really frustrating for me.

Four interviewees reported feeling a greater level of relaxation after a hike. One of those interviewees, Mario, admitted that he never liked hiking until the start of the current school year, when he agreed to join a friend. Mario now hikes once or twice a month in the Marin County Headlands. He reported that hiking alleviates the stress associated with school, at least on days when he was not on medication. “When you aren’t stressed, it’s easier for you to have more ideas,” Mario said. He recalled an occasion when he used the time hiking with a friend to incubate new ideas for a school paper. “We would just sit there and talk and I would just imagine my essay. [My friend] would give me his opinions and I would start thinking about it,

and then I would feel pretty good,” he recalled. But now he prefers to go hiking for enjoyment after his work is done:

When I finish my work and I get everything done and I go hiking. It's not as stress reliever, but it's more rewarding [once] I already got everything done and I don't have to worry about anything. I just enjoy the view.

Most of the respondents ($n = 5$) described how hiking delivers a unique and valuable form of relaxation different from the kind they get doing other breaks from school, such as socializing with friends or listening to music. Mario added that his walks around downtown San Francisco with his iPod are also relaxing, but not in the same way as in the more rural and undeveloped Marin Headlands. He described having a more expansive mindset on the nature hikes. “I use the music to change my mood, but [in the Headlands], I don't know, I think I get more philosophical.”

Impact on mood. Participants' affective responses to nature were uniformly positive. Several used terms such as “trapped,” “cabin fever,” or “antsy” to describe being inside for extended periods of time. Courtney said she often feels profoundly “stuck” if she spends the majority of her day indoors. “Just because being outside makes me calmer and less rushed to do things. I think I just feel better when I'm outside because I know that I'm not stuck in one place,” she said. Courtney added that it is easier for her to read outdoors because natural surroundings are more “enjoyable.” Ethan noted feeling “happier” and “comforted” when he was outdoors in pleasant weather. “When I get the midday warmth from the sun I will just feel better about what's happening in my life, just have a better overall mood.”

Mario, was able to give a definitive answer when asked if he noticed any differences in mood when he spends time indoors versus outdoors:

It depends on a lot of factors, I don't know. I can spend three or four hours in the morning classrooms. Then [after morning classes] I have to walk across campus. So during that break I will think to myself, "I've got to get out of here." So if I go and walk around the quad to see the sun (or even the just the fog) just to get out of this building. I get sick of it.

Similarly, Ethan reported that he gets "cabin fever" after he spends a whole day in classes. In addition to feeling "antsy" he said he also notices changes in his mood at the end of a long school day. "I think the times I'm outdoors I definitely can notice my mood picking up even if I'm just eating dinner outside on the porch with the sun going down. I definitely notice an acute difference."

Natural light versus artificial light. While descriptions of cabin fever in the previous subsection portray indoor environments as being void of nature, ADHD symptoms varied based on exposure to natural light inside classrooms and study rooms. When asked if the presence of natural light affects their ability to perform, four out of six participants confirmed that they perform better when in rooms with natural light. One of those four participants, however, cautioned that natural light helps as long as there is not visible, distracting stimuli outside. In contrast, Courtney said that windows provide a diversion that actually enhances her ability to pay attention. She said it is difficult to explain the apparent contradiction of relying on distractions out the window in order to focus on lectures:

I guess when I am in class I tend to try to sit near windows without even really thinking about it because I find it easier to listen to my professor's lectures if I can look out the

window. I have part of my focus being out the window and seeing the things that are out there, but then the other part listening to what he is saying Just not having to focus 100% of my attention on my one professor and his one lecture, but being able to look out the window and seeing what's going on out there, somehow makes it easier for me to focus on the lecture. I think it's just something about being able to place all of my different attentions and energies somewhere, even if looking out the window is obviously not a very strenuous or noticeable activity. But at least it's something else that I'm doing. And so I don't have everything, like all of my energies and all of my attentions aren't piling up on top of this one main thing, which is to listen to his lecture. It's not piling up and it doesn't feel so overwhelming for me when I can just divide it in really simple and almost unnoticeable ways like that.

Ethan stated that he prefers natural lighting to the “harshness” of fluorescent classroom lighting, which he said makes him feel “dulled” and “worn down.” In terms of attentional functioning, sitting in a room with natural lighting was sometimes helpful to Ethan, alongside the benefits of his medication:

When I had the warmth of the sun hitting the window, I felt like I wasn't as antsy as I may [otherwise] get, even though I will get really focused when I take my meds, obviously. I feel like [school or studying] wasn't as much of a drag and all the subject matter that might be easier to take in. And I felt like I wasn't as antsy, I didn't have as much of a disposition to want to change things up. There is a small music library here that is really nice and intimate, with big wooden tables. But still, in a way can be kind of maddening, it can get on your nerves, having no natural lighting, having that sterile kind of blaring artificial lighting.

Similarly, Derek said he felt more comfortable when working in a room that was bathed in sunlight:

When I'm studying with light, like it's early, like around this time, and I see the sun coming in, it's easier for me for some reason. Because when it's getting dark and I turn on the desk light I'm just here, I don't see anything. It just makes me feel kind of trapped.

In contrast to the other subjects, Derek and Chanda said that when it comes time to study hard for extended periods, they prefer artificial light. Derek, a snowboarder, said a typical study session involves forcing himself to work inside a library study carol:

I feel like, by looking outside it makes me get distracted even on my meds. It makes me just, I want to be outside right now but I can't because I have to be inside doing homework but I'm in one of the study carols. It's like, all right, it's time to go away and do my work. And I can come back out again and go look outside.

Chanda had similar feelings about needing to shut out all external stimuli. She said:

I like reading for pleasure by a window, but when I have to cram, I'll be at a desk or in bed with a light shining down right on that book. It's easier to focus. But when I'm reading for enjoyment or pleasure or something that sparks my motivation, even a philosophy textbook, I'd rather be by a window, or lay a towel in the grass or against a tree.

Fascination and effortless attention. As well as mentioning reduction in stress, five of the six interviewees described states of wonder, awe, and fascination consistent with effortless attention as defined in Chapter II.

For example, Chanda said:

I get fascinated in different ways outside. Yesterday I took a slow walk through the woods with the goal to see different kinds of mosses, to get up close to them, to see the way they creep up trees...I sit looking at the designs of nature, the patterns.

Courtney noticed that when outdoors, her attention was constantly engaged by novel stimuli. “Being outside in nature, you never really know what's going to happen, there is a lot of surprises, and not everything is so structured and planned out. I really like that aspect of it.” Her enjoyment of nature as something that simultaneously engaged and relaxed her was echoed by Derek, who said he found relaxation “just staring at clouds and stuff.”

Ethan, a biology major who studies ecology, said he became “fascinated” when he thought about the interplay of species in a forest. In this instance, Ethan’s definition of fascination spoke to an intellectual process was different from the type of fascination cited by the other interviewees. However, Ethan said he also engaged with the natural environment in a way that is more consistent with the other interviewees. “I may appreciate more when I'm not being mentally thinking about it — when I'm just kind of taking it in. Intuitively there is like an appreciation...It kind of feels, on better days, like wonder.”

Two interviewees said the process of relaxing into effortless attention was much easier when they were children. Mario described going camping with his nephews who “find absolutely everything so interesting. They see a bunch of ants and they just look at them for a while. It makes me jealous because I used to be like that.”

Participants were very attuned to their struggle to maintain focus and attention, and the emotional distress related to ADHD. They are also quite aware of the positive behavioral and

cognitive reactions that occur in natural environments. As illustrated in the last comment, there is a desire to return to a time and place in their past when it was easier to sustain attention without becoming bored or stressed. The next section further examines this study's core questions about how nature may or may not foster these types of restorative experiences.

Experiences in Nature

Participants described responses to natural phenomena based on both objective characteristics of nature, and highly personal experiences in nature. Derek, an avid snowboarder who routinely takes weekend trips to the Sierra Mountains, described in stark terms the difference between school time, when he takes Concerta, and his trips to the Sierra Mountains, when he doesn't take the medication. He reported being able to think more "freely" when in nature. Derek said he could also choose one thing to focus on, and focused better as a result:

It's hard to focus every single day and wake up every morning and focus, focus, focus. Between Monday and Friday I take my medication and on the weekend I don't take it, I just snowboard and I just go free. I'm in nature. And then I come back and it feels like "Wow, I had such a good weekend out in nature that I feel motivated to do it again." I want to do well in my classes so that I can keep going out to nature and keep going snowboarding. And when I go snowboarding I feel I do well in my classes. When I am in Tahoe and not on my meds, it lets me just think freely about instead of tons of little thoughts and ideas of things that I have to do, and other little lines jumping off of everything. When I am off medication, all these things come to my brain and I choose one of them and then I am like, "Oh that's interesting." I can stick to one random thing all the time instead of trying to think about everything.

Samir, who was interviewed alongside Derek, related his experience to the previous comment. Samir recalled a skiing trip he took with his father during a school vacation. He contrasted experiences being on and being off medication while on the trip. Samir agreed that it was easier to focus on the present moment after stopping the medication for a few days:

I can just tell that I'm not really thinking all the time about what I have to do next I think I can just enjoy myself more if I'm outdoors and not on my meds. But if I'm on meds outdoors, I'll still think about schoolwork and things I have to do when I get back. Although he reported having felt a sense of enjoyment in the outdoors while off his medication, Samir said it did not positively or negatively influence his ability to concentrate.

Responses to natural phenomena. Describing the effects of nature on symptoms of ADHD, participants reported influences from a wide range of objective factors, including quietness, greenery, and sunlight. When describing what they notice in outdoor spaces, the vast majority of participants ($n = 5$) noted they experienced a state of quietness that was associated with living in a fast-paced, urban environment.

Courtney said she enjoyed “listening to the sounds of nature, the birds, the wind and things like that in the background.” Chanda also enjoyed the process of listening. “It’s nice being out there, being quiet, and listening for way the wind blows through the trees. I hike up these crazy hills and listen for the wind.” Courtney also said she seeks out nature for “the feeling of fresh air,” and exposure to sunlight.

When speaking about quietness, two other participants also noted the difference between camping overnight with a large group of friends versus camping with a smaller group, or their families. They both reported having had a more powerful, immersive nature experience when there was less chatter from other people and a greater sensation of “stillness,” as Chanda phrased

it. Mario reflected on several camping trips with large groups of peers and recalled that they distracted him from being able to really appreciate nature. “But when I go camping with my nephews, we just walk on a trail, and they stop and look at everything that they see.”

Most interviewees said they were most affected by nature only when they left the city. Others such as Mario, who grew up in Southern California where green space was rare, said he was drawn to, and “enjoys”, urban parks.

I live two blocks from Golden Gate Park and I go all the time. When I walk around here, I will look at a tree or a garden, and it’s just great. That’s why I like San Francisco — you see green areas everywhere. So when I go to LA, I just see cars and highways and more cars, and it’s like “Oh, I’m far from home.” I like San Francisco a lot more.

Conversely, Derek described San Francisco as “very chaotic.” He said he could not respond to nature on a deeper level unless he was in a wilderness area.

Personal definitions of nature. Respondents brought a wide set of associations to how they conceive of nature. Nevertheless, all six respondents described at least a general sense of retreat, leaving the cares and organization of daily life behind. Derek and Ethan noted the power of vistas or panoramic views, even if those views are not of wilderness or the ocean, but of the city off in the distance. Ethan described the outdoors as an escape, one that was both physical and psychological:

Being outside I am able to just get outside of my own troubles and see a bigger perspective on things, especially if you have a panoramic view, or something a little more grand like a forest. It helps my mental stress to get outside of myself. I’m not so caught up in my thoughts and my worries, which can be all over the place.

Ethan defined nature as a distant place, far from his home in Berkeley in terms of geography and psychology. He distinguished the two, calling them “on trail” and “off trail.” He said, “I like the off trail concept of a lot. I feel ‘on trail’ here in Berkeley and San Francisco, but when I am in Tahoe it is very, ‘do whatever you want,’ very ‘off the grid.’” Chanda also understands nature as a place free from expectations: “I don’t feel as pushed by society. In the school environment where every goal is to graduate and get a job, everyone around you is pushing and rushing. I don’t feel that way in nature at all.” In contrast to two participants, who defined nature as being a wilderness far away from the city and suburbs, three participants described nature as being anywhere that was not indoors.

Two participants described ways in which they intellectualize nature as a way of reaping its benefits. They said they liked to make sense of their surroundings by approaching the environment with a scientific lens. Ethan said, “When I’m in a forest, I see the ecology of it. There’s all these factors, like abiotic factors and biotic factors and some man-made factors as well. The whole dynamic interplay is pretty fascinating.”

Three interviewees described their relationship to nature in terms of religion or spirituality. Two of those interviewees described unexpected moments of transcendence while the other, Chanda, deliberately seeks religious experiences while on hikes in the woods. She said:

People go to church to feel a connection with God. I go to nature. I think God is everywhere; it exists everywhere as a creator of all things. I see a silent beauty in nature, in the roots of trees, branches, and so on. I feel being outside is reconnecting with something so old, and so deep, and that it’s our spiritual responsibility to maintain the connection ... I don’t bring music on a run in nature. I don’t want to start thinking about

my mom or whatever. I will just focus on my breath. Experiencing God's grace in nature doesn't depend on whether I'm walking, running or climbing a tree. I go into a mode. I like to assign myself to stay focused when I'm outside, not in the same way as when I'm doing homework, it's more like going to church.

Ethan remembered an experience in a redwood forest at age 15 that he described as amazing and awe-inspiring. "I felt like I was somewhere almost sacred. It was so lush and old and quiet. It felt almost like some sort of primordial temple almost, like a temple of nature."

Experiences with ADHD and Medication

Although this study focused on the subject of experiences in nature, five out of six participants were compelled to provide context to their responses by volunteering details about their struggle with ADD/ADHD. All five of these participants also currently take stimulant medication and discussed the role the medications plays in their daily lives. In some cases, participants raised the subject of medication to differentiate between experiences while on medication versus experiences while off it. They considered themselves as having two distinct sets of experiences with medication, both in nature as well as their daily lives. For many, the experience of taking stimulant medication was inseparable from the experience of having an ADHD diagnosis. The effects of the medication have such a powerful influence on their personality, thoughts and behaviors that the drug's effects have come to define the disorder.

Overall, what emerged from these overlapping threads was a portrait of a college student who was constantly racing from task to task, but who ultimately valued ADHD medication's ability to deliver its promise by promoting greater focus and productivity. Each of the five participants who reported taking medications, described going into a state of intense focus to get work done.

Derek, who has been on medication since age 7, presented a nuanced view of the medication's effects. He recognized its benefits, but also wished he had had an opportunity to grow up without medication. He questioned the validity of the diagnosis:

I feel like every kid looks like they have ADD because they are just running around and happy and excited. How can you really know if someone has ADD when they are seven years old? That's crazy. But my parents put me on meds, so whatever.

Derek went on to describe the stimulant medication Concerta, and its effect on his state of mind, energy level, and ability to perform:

It puts me in robot zombie mode, which is good, because I stay on track and get all my work done. The clock is always moving and moving. But when people see me during the day on campus, I am like, "Sorry, I've got to go. I am on part J, and I'm going to K. I've got to get to Z at the end of the day. I'm on the clock. I'll see you. I'll talk to you Tuesday when I'm not on the clock anymore." Then, when I come off of the meds, when they stop working at the end of the day, I just feel drained. I feel like I just put all this effort in and [then] I become almost useless.

In contrast to Derek, Mario had only recently begun taking medication. He started at the beginning of the current school year and reflected, "Before I was on meds, I hated being in school. I didn't tell people about it for so many years, but I just hated it." Courtney was also recently diagnosed and prescribed medication. Even with the medication, she reported feeling "often overwhelmed by the amount of school work I have to do and I just don't have enough time to get it done."

Samir and Derek said medication causes racing thoughts, a common trait of people with ADHD. But rather than being either wholly positive or negative, they described medication as a

double-edged sword: Medication exacerbates the “problem” of racing thoughts, but with positive effects on their ability to focus on tasks and perform in school. According to Derek: “[The medication] is stimulating your brain to be able to think, not focus on things, but to be able to think openly about multiple things at the same time.” Similarly, Samir can relax in the present moment only when he stops taking medication:

After a few days of not taking my medication I can just tell that I'm not really thinking all the time about what I have to do next. [Being off of meds] is more about being in the moment and just enjoying what's in front of you rather than thinking, “Oh, when I get back to home I have to do this, and I have so much work.”

Three participants used negative descriptors such as “zombie,” “robot,” “computer” and “machine” to illustrate how they feel while doing schoolwork on medication. Samir disagreed with those analogies. He said that stress was largely a matter of time management:

I wouldn't really call myself a machine. There are definitely some days when you have to lock yourself up and power through a ton of work, but I try to avoid that as much as possible and space it out so that I don't have to have days like that.

Ethan said that medication made him feel “antsy” and gave him “a disposition to always want to change things up.”

This section examined descriptions of how symptoms of ADHD and stimulant medication affects participants’ daily lives. The descriptions provided valuable contextual data by allowing participants a way to compare and contrast existing treatment (medication) with a potential future treatment (nature therapy), the focus of this study.

Summary

In the above findings, it can be concluded that participants found that time spent outdoors and in natural settings helped relieve symptoms of ADHD as well as the accompanying stress, which aggravates symptoms. Participants reported that nature offered certain qualities that allowed them to leave their cares of daily life behind. In other instances, participants reported actively using nature to redirect their attention away from stressful thoughts or feelings. In both situations, the result was a decrease in levels of stress and accompanying restoration of attention.

The following chapter will further discuss these findings and illustrate their relevance to the previously reviewed literature. Furthermore, I will consider the implications of the data gathered, highlight the relationship to social work practice, and identify possible areas of further research.

CHAPTER V

Discussion

The primary aim of this study was to investigate whether time in nature supports attentional functioning in college students with Attention-deficit/hyperactivity disorder (ADHD). The complexities of students' experiences in natural environments were explored through the narratives of six students who are diagnosed with ADHD. This chapter reviews the key findings and opens a broader discussion of the findings in the following order: 1) key findings as compared to the previously reviewed literature; 2) implications; and 3) directions for future research.

Key Findings

Attention Restoration Theory. Overall, students reported that activities in green outdoor settings reduced attention-deficit symptoms. Key findings pertaining to attention restoration were obtained from the narratives of six students interviewed for this study, and are supported by the previously reviewed literature. Specifically, participants described various states of attention and behavioral changes that were consistent with Attention Restoration Theory (ART). Most participants reported regularly being assigned schoolwork that demanded sustained periods of focused, and “directed attention” in order to complete. Participants experienced mental exhaustion as the result of overexerting their attention on a particular task, a mental state that ART defines as “directed attention fatigue.”

As noted by Cimprich (2007), many symptoms of ADHD are consistent with directed attention fatigue. This study's participants confirmed the similarities to ADHD in their experiences of focusing on school assignments for extended periods of time. For example, Derek's struggle with having to "focus, focus, focus" everyday in school was indicative of the mental fatigue that occurs as the result of prolonged directed attention. In the context of evolutionary biology, according to (Kaplan, 2005), susceptibility to mental fatigue is an expectable outcome. Therefore, expressions of ADHD symptomatology, such as Derek's, may be a natural reaction to stressors that humans are not predisposed to continually manage.

As the literature regarding ART showed, stress and attentional deficits are caused when directed attention deprives a person of experiences that provide "effortless attention," which are characterized by spontaneous, automatic thinking (Kaplan, 1995). This type of automatic thinking is often described in the literature as a state of fascination. Notably, three of the six participants used the precise word "fascinating" to describe aspects of their nature activities. They cited experiences of fascination caused by what Ryan et al. (2010) referred to as nature's unique ability to provide "novel and diverse objects." Courtney noted that she was drawn to nature for its ability to surprise her. Derek said he was relaxed "just by staring at clouds." Ethan was "fascinated" by the complex and often mysterious relations of living organisms. Chanda allowed herself to gaze at nature's patterns and designs for hours with a sense of awe and wonder. This type of effortless attention (the third of four types of attention defined by ART) is what allows the mind to rest and ultimately leads to restored attention (the fourth and final type).

According to the prior research on ART, restorative environments can also include indoor settings when there is a view out the window that offers novel and diverse objects. This was reflected in the case of Courtney, who reported that she would unconsciously choose to sit near

windows in a classroom. She reflected, “seeing what's going on out there, somehow makes it easier for me to focus on the lecture...it doesn't feel so overwhelming for me when I can just divide it in really simple and almost unnoticeable ways like that.” Likewise, Ethan reported that studying by a big window in the library helped him feel “less antsy” and less “worn down.” He said: “I didn't have as much of a disposition to want to change things up.” These findings were also consistent with the literature, particularly the work of Taylor and Kuo (2009) who found that children who played in windowless indoor settings had significantly more severe symptoms than did children who played in grassy outdoor spaces, with or without trees.

However, in contradiction to the literature, several participants in this study reported that they study best in windowless rooms void of any visual stimuli. Students' practice of avoiding external distractions seems to be a commonsensical study strategy that is not accounted for in the literature. One possible explanation is that self-isolation in windowless rooms is a practice unique to the subset of participants on stimulant medication. The behavior seemed to benefit students who were on stimulant medications more than other students with ADHD not currently on medications. The reason, indicated by study participants, is because stimulant medication intensified whatever state of attention the participants happened to be in. For example, if participants were able to focus, it would lead them to experience states of hyperfocus. On the other hand, when participants reported difficulty focusing on tasks, stimulant medication seemed to exacerbate ADHD symptomatology, including racing thoughts, multi-tasking and distractibility. Thus, the intensification of attention states on medication is a double-edged sword. Medication often improved participants' academic productivity but it could also cause obsessive-like multi-tasking. Here we see that that medication carries the risk of being counterproductive to treatment.

Indeed, in *The Anatomy of an Epidemic*, Whitaker (2010) cited a landmark study in which participants using medication over a 24-to-36 month period paradoxically showed increased ADHD symptomatology relative to those not taking medication. Core symptoms such as inattentiveness, impulsiveness, and hyperactivity actually worsened. In summary, the findings from this study indicated that nature provided restorative attention, and offered at least modest relief to the participants' symptomatology. While the literature asserts that nature is, in fact, the *most* effective source of relief for directed attention fatigue (Kaplan, Kaplan, & Ryan, 1998), the scope of this study did not include comparisons to other restorative environments.

Stress and attention. Similar to ART, Stress Recovery Theory (SRT) is also supported by this study's findings. As cited in the literature review, SRT suggests that responses to stress are located in the limbic system, which generates primal fight or flight survival reflexes to help cope with dangerous situations. As the interviewees in this study attested, people in modern life find themselves on constant alert, being "chased" by a relentless stampede of stressors and assaults including cars, crime, threatening images on television, and so forth. There are also the mental demands of living in contemporary society where survival of the fittest now means adapting to information overload, spiraling expectations, multitasking, balancing the demands of work and family, and coping with stress. And unlike our ancestors, we required to sit still indoors for extended periods of time. Some of these challenges are particularly acute for the students interviewed in this study, who spoke in great detail about the pervasive negative impacts of stress on their daily lives.

The therapeutic effect of nature reported by this study's participants is hardly a placebo effect. As Louv (2011) noted:

Genetically, we are the same creatures as we have been for thousands of years. Probably, at a cellular level, we have inherited the efficient antidote to all of this: short, quiet encounters with natural elements that can simply calm us down. (p. 55)

The findings from this study that addressed issues of stress were consistent with the work of Hancock and Warms (1989), Kaplan (1995), and Gatersleben (2008). Furthermore, this study's findings showed that restorative environments foster improvements to both stress and attention fatigue that are distinct from each other but also closely related. Most participants described their stress levels as having a positive effect on attentional symptoms. The mechanisms behind the shift seemed to vary. Some reported that nature improved stress and attention on a cognitive level by providing a diversion in which nature redirected their thoughts about school. Others reported that nature experiences eased physical tension and provided a break from frenetic daily life — what D'Aleo (as cited in Leyden, 2009) described as her students' "overtaxed senses in these modern times."

One particular mechanism by which nature was shown to have a restorative effect on attention was linked to the element of quietness in nature settings. Prior research on the stressful effects of noise (Evans & Maxwell, 1997; Evans & Johnson, 2000) has shown that it impairs students' ability to perform in school. Indeed, participants responded positively to the departure from urban environments, where dense populations leads to stress-inducing "human friction," as well as a relentless deluge of noise (Lederbogen et al., 2011). Urban areas were described words such as "chaotic" and "crazy" whereas the quietness found in nature was associated with relaxation. However, questions still exist about how and why noisy settings affect stress. Using

self-reports, prior research has shown that differences in perceived stress are not a function of noise exposure, a sign that people become habituated to noisy environments (Evans, 2000). People believed that noisy environments did not affect performance despite quantitative evidence (test scores) to the contrary. Therefore, there was ambiguity regarding subjective experiences of noise. The findings from this study supports the Evans study by showing that while students may not believe that noise hinders their school performance, they are at least aware that periods of quietness in natural settings will assist it. Therefore, the finding that subjective experiences of feeling less stressed in quiet places, serves to validate and enhance the previous studies of noise, stress and attention.

Experiences in nature. Science has a difficult time defining how people perceive nature (Louv, 2011). Indeed, this study allowed participants to draw on a wide set of associations and experiences using a definitions of nature that were broadly defined relative to previous studies. These experiences could include aesthetic, sensual, physical or intellectual approaches to nature, and could be found in wilderness and city parks alike — or even the presence of natural light in a classroom or library. For some participants, nature was defined as something existing solely in wilderness in one extreme, and for others it included parks in the heart of the city. For one participant, however, nature was confined only to areas that are considered wilderness. For this young man, nature is entirely separate from civilization. This study’s allowance of personal definitions of nature, and the resulting diversity in perceptions, stood in contrast to previous literature, which typically defined nature as a particular type of location. Absent of more clearly delineated definitions of nature and the corresponding effect of different settings on attention, this study could not measure the benefits of urban settings versus wilderness settings.

Definitions of nature, however, may have been irrelevant in the sense that all students reported nature as having the power to transport them, altering their sense of time and place. Nature's power to transport the students was exemplified by the spontaneous, unprompted stories about its contribution to their spiritual life. The topic of spirituality was addressed in great length by Louv (2005) in *Last Child in the Woods: Saving our children from nature-deficit disorder*. Though I did not address spirituality in my prior review of the literature, this was an unexpected finding that spoke clearly to Louv's work. Louv (2005) described the "spiritual necessity of nature to the young" as a topic that receives little notice (p. 298). He wrote: "The absence of research suggests a little nervousness. After all, a child's spiritual experience in nature, especially in solitude, is beyond adult or institutional control" (p. 298). The surprising desire by this study's participants to volunteer stories about their spiritual affiliation in nature implies that the connection between nature and spirituality is a common predisposition; it is more than what some religious institutions suspect is a "creeping, cultural animism" promoted by New Age charlatans or those with an "environmental agenda" (Louv, 2005, p. 298). Rather, I suggest that much of what participants described was a form of tapping into a primal state of wildness — instinctive, sensual, emotional, and imaginative qualities that have become tamed in adulthood. It could be the expression of what Freud called the id. Looking at the findings regarding religion and spirituality, nature could be described as providing the function of a quasi-temple for participants to worship in. However, a more precise interpretation, one championed by ecopsychologists, may be that nature serves as mirror for one's repressed inner wildness.

Implications

Implications for practice. In sum, this study's findings suggest that students diagnosed with ADHD who engage in outdoor activities on a regular basis, function better both during the

activity and for some time afterward. These findings have a number of implications for practice. For students with ADHD and their parents, these findings have a clear and inexpensive implication: Students with ADHD can support their attentional functioning and minimize their symptoms simply by spending time in green settings.

More specifically, students and professionals might use this study's findings in the following ways. Students can use these findings to enhance school performance. Before engaging in attention-demanding tasks such as schoolwork and homework, students might maximize their attentional capacity by spending time in green settings. Students might also reduce the overall severity of their symptoms by spending time in green settings on a daily basis. Additionally, something as simple as seeking views out a classroom or library window onto a green space may provide much needed rest of directed attention. Clinicians who work with ADHD could include the natural environment as a routine part of the assessment and treatment planning activities. There is already a desire to address environmental issues. In the study by Shaw (2006), over 90% of social workers felt the natural environment should be discussed in social work education.

The suggestion regarding environmental assessment is particularly important considering that environmental problems impact vulnerable populations disproportionately. Environmental racism is historically understood as a crisis affecting urban poor and people of color with disproportionate negative impacts of pollution, toxic waste and other hazards. The environmental justice movement has worked to improve conditions through grassroots and electoral politics. But where the physical effects of pollution are well documented, relatively little is known effects of environmental degradation on mental health and childhood development. If, for example, access to nature or quieter environments, have a positive effect on

test scores, as studies have shown, then it becomes imperative to improve access. This study belongs to a larger body of emerging research, which will hopefully expand upon definitions of health to include access to nature.

The National Association of Social Workers (NASW) has already begun to consider the importance of considering the natural environment in social work practice. The NASW (2009) policy statement on the environment recognizes the impact of environmental degradation and pollution on vulnerable and oppressed communities and groups, healthy food, children's health, workers in hazardous jobs, and people in less wealthy countries. It specifically calls for incorporating information about the natural environment in assessments of "those clients most likely to be victimized by unsound and unsafe environmental practices" (p. 128). In addition to environmental assessments, other justice-oriented approaches to social work could practical ideas for such as developing community gardens, and advocating for school-based interventions including environmental science curricula and field trips.

It might be easy to think that the populations that social workers work with have problems serious enough that considering the natural environment's role in their lives is a low priority. While this may be true in addressing certain problems, the tendency to disregard the environment's importance in their lives may be both a privileged perspective and a result of our general disconnection from the natural world.

Implications for social work in a historical context. Despite recognition by some pioneering social workers of the harmful effects of environmental conditions in the growing cities, the field of social work seems to have paid little attention to such issues over its history. With the majority of Americans living in cities or built environments, urban life has become the norm and therefore the context for much of what social workers do. The emerging data

regarding nature's role in ADHD (and more broadly, in childhood development) suggests that social workers who work with families and schools should strongly consider the role that nature plays for students in these contexts. This study further points to this need.

Louv's (2005) discussion of the decrease in American families' direct experience with green spaces and its potential impact on child development — a decrease in opportunities for unstructured activity in nature — can be taken into account by social work and may indicate a need to address current deficiencies in child development.

Directions for Future Research

In this study, I examined functioning after participation in nature experiences but did not measure the duration of the experiences or the duration of the effects. Future research might explore the temporal characteristics of the relationship between nature and attention. Is it necessary to spend some minimum amount of time in nature-related activities to experience the restorative benefits of nature? For students with ADHD, how does a 10-minute walk in the park compare to a 30-minute walk in the park in terms of restoring attentional functioning? Kuo (2008a) has proposed that future research should determine the shape of the *dose response curve* for nature and attention. For example, perhaps attentional functioning increases with increasing exposure to nature only up to a point, after which the benefits level out and additional exposure to nature produces little additional benefit. Another issue that deserves investigation concerns the duration of the effects. How long do they last? Do the effects degrade in a linear fashion or do they degrade suddenly?

Additionally, future research might replicate these study questions with similar or other populations and in other settings (e.g., students with ADHD in the southwest United States, or college students without ADHD). For example, do students who have more access to nature or

live in particularly green neighborhoods function better throughout the day than students who attend less green schools, or schools in blighted neighborhoods? If disparities in attention functioning exist between such schools, then there are potential environmental justice issues at play and the research would have valuable policy implications. Furthermore, future research might explore which specific elements of green settings are crucial in supporting attentional functioning.

Finally, there are some cautions regarding this study's limitations and generalizability. This study's small sample size of six participants, limited its generalizability. The students in this sample had a wide range of attention-deficit symptoms, and stimulant medication regimens varied among them. A future study with a larger number of participants is recommended to offer a wider range of responses and thus be more representative of college students. It would also be valuable to conduct a longitudinal study, which examined changes in attentional symptoms over time and in different environments.

Conclusion

Although the findings establish a strong relationship between nature and attention, they do not suggest a direction to that relationship. Because these findings indicate improved attentional functioning both during and after nature experiences, it is not possible to determine with certainty whether participation in outdoor activities causes improved attentional functioning or that improved attentional functioning causes participation in outdoor activities.

This study has shown that nature may support attentional functioning in college students with ADHD. These findings have tremendous implications for millions of young adults struggling day-in and day-out with attention-deficit symptoms. These college students and their families could potentially benefit from something as simple as spending time in green areas. In

addition, these findings hold potential value for students who do not have ADHD. Optimal levels of attentional functioning are essential for *all* students so that they maximize learning and achievement in school. Thus, all students' attentional functioning may benefit from something as inexpensive and direct as incorporating nature activities into places where students live, learn, and play.

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Appendix A

Human Subjects Review Application

Investigator Name: Roger Sideman

Project Title: Nature's Ritalin? The Effects of Green Space on Symptoms of ADHD in College Students

Project Purpose and Design

The purpose of this study is to explore the ways in which exposure to outdoor green spaces affects symptoms of ADHD among diagnosed college-aged (18-25) students. I will be collecting both qualitative and quantitative data. Using individual interviews and focus groups, this study seeks a richer understanding of how the physical environment impacts attention functioning. More specifically, this study will identify measurable difference in college students' perceived symptoms when they spend time in nature. The central research question is: How does exposure to natural green space affect symptoms of ADHD? Participants will be asked to describe their observations regarding their effects of different activities and activity settings on their symptoms.

The research question is relevant to social work practice and behavioral therapies because it provides another way to understand ADHD. The research will be used for my MSW thesis, presentation, and publication. It is hoped that social workers can apply the findings to further scrutinize current methods of treatment as well as assist individuals affected by ADHD who are not responding to traditional treatments.

Research has shown potential for nature to alleviate ADHD's crippling problems of impulsiveness, inattentiveness, and hyperactivity. A series of studies that examined behavioral changes experienced while in the outdoors led to the development of Attention Restoration Theory (ART). ART asserts that prolonged focus on a particular task can strain an individual's

ability to pay attention, and that nature has a special ability to restore attention. The theory contends that people can concentrate better after spending time in nature, or even looking at scenes of nature. With high demand for alternatives to stimulant medication, new research grounded in other approaches, such as nature-based interventions, will serve to legitimize and expand upon existing therapeutic treatments.

The Characteristics of Participants

Inclusion will be contingent upon having a clinical diagnosis of ADHD, as provided by a licensed mental health professional. Participants must be 18-25, enrolled in a college program and taking at least 12 credits as undergraduates or 9 credits as graduate level students (the FAFSA requirements for full-time status); must have access to a computer and email; and must be able to speak and understand English. Pregnant women will be excluded from participation, as well as anyone who does not fit the inclusion criteria. To optimize diversity in findings, the study will be open to participants regardless of gender, sexual orientation, race, ethnicity, socio-economic status, physical and mental health status, and religion. The desired sample size is 12 participants. Focus groups will consist of three or more people. Individual interviews will be conducted if the minimum of three participants is not reached at any given campus, or if students are unavailable at the same time.

The Recruitment Process

Participants will be recruited by the posting of flyers (see Appendix E) on public bulletin boards at four San Francisco Bay Area campuses: Stanford University, San Francisco State, University of San Francisco, and UC Berkeley. At Stanford, flyers will be hung in designated public spaces. If permission is granted (request still pending) flyers will be distributed in staff mailboxes at the Schwab Learning Center, which serves students with ADHD.

After potential participants have responded via email, there will be a 5-10 minute screening phone call to verify eligibility to participate (see Appendix B). At this point, I will inform participants that the study will examine their experiences indoors vs. outdoors and how those experiences may or may not affect attention. Once eligibility has been determined, interviews will be scheduled. Whether a focus group or individual interview is conducted depends on the response rate at a particular location. Participants will be notified during the screening phone call that if fewer than three people from a school are available to meet in a focus group, individual interviews will need to be arranged. I will notify participants in a follow-up phone call whether an individual interview will be held. Individual interviews will take place inside campus library study rooms.

Diversity in the sample is critical for obtaining representative results therefore participants will be solicited from a diverse selection of schools, including city and community colleges, and private institutions.

The Nature of Participation

Data will be collected through individual interviews or focus groups depending on the number of volunteers at a given school. If three or more people respond, a group will be organized. Individual interviews will last 30 minutes, and groups will last 45 minutes.

At the outset of the meeting participants will be required to read and sign informed consent forms. Those who do not wish to sign an informed consent form will not participate in the study. Pizza will be served. (An \$8 gift certificate to a local pizza or sandwich shop will be offered to individual interviewees.) Interviews will consist of open-ended and close-ended questions (see Appendix C) and follow-up discussion questions. Participants will be asked to talk about how outdoor experiences or indoor conditions such as natural lighting and fresh air affect

their ability to concentrate, hyperactivity and stress levels. I may take notes during the interviews, which will be recorded by audiotape. I will transcribe the tapes myself. The transcripts, notes and audiotape will be kept in a secure location.

The interviews will take place in campus library study rooms in order to provide confidentiality safety for the participants. Use of library study rooms has been granted on a "first come, first serve" basis at UCSF Parnassus Library, USF Gleeson Library, and will be available by reservation at UC Berkeley Bancroft Library. Access to study rooms at Stanford University's Green Library and Meyer Library are available "first come, first serve", but do not allow food or drink. An alternative site will be arranged at Stanford's Schwab Learning Center. Participants will be given a list of community referral resources before exiting (Appendix D).

Risks of Participation

This study has been designed to minimize risk from participation. However, confidentiality will be limited for focus group participants because others in the group will hear everyone's answers, and I will not be able to control what is revealed outside of the group. Additionally, participants may experience some psychological discomfort in divulging how ADHD has affected their lives. At the conclusion of the interviews, I will distribute a list of resources (see Appendix E) to all participants about local agencies and organizations that may be helpful to those with ADHD. All identifying information will be held in confidence. Participants will be required to give informed consent, which will ensure that they understand the possible risks and benefits inherent to participation.

Benefits of Participation

Participants may benefit from sharing their personal stories, and by gaining new insights about how time spent outdoors, or previously unnoticed changes to their physical surroundings,

affects their ability to concentrate. In addition, the information they share will be passed on to other social work students to use for future research. Participants may also benefit from the knowledge that their stories are helpful to others and to broadening awareness of ADHD. An additional benefit of participation is a coffee card or iTunes gift card worth \$10. Participants will be served a pizza dinner and offered a \$10 coffee shop or iTunes gift certificate. Participants will be rewarded even if they fail to complete the interview.

Informed Consent Procedures

Participants will be asked to read and sign an Informed Consent Form upon entering the interview room, and before dinner is made available. They will be provided with a copy of the form to take home. Minors and those who do not understand English will not be included in this study.

Precautions Taken to Safeguard Confidentiality and Identifiable Information

All identifiable information on all data and forms collected will be kept separate from audio files of interviews, and names will not be recorded in the audiotapes of the interviews. Precaution will be taken to ensure that participants' personal information in the final paper is not identifiable. My Research Advisor will have access to the data only after identifying information has been removed. Any case vignettes and quoted comments will be de-identified from the participant when information is presented in publication. All Informed Consents and audio files will be stored in a locked file cabinet and kept secure for three years as required by Federal regulations. After that time both Informed Consents and the audio files will be destroyed. If materials are needed beyond three years, I will continue to keep them secure, and destroy them when they are no longer needed.

The Voluntary Nature of Participation

Participation is voluntary and participants may refuse to answer any question.

Participants may withdraw from the study at any point. If participants wish to withdraw, they can provide me with verbal or written request.

I will explain to participants that they may withdraw from the study at any point up to April 1, 2012. For individual interviews, I will ensure that their information and audio files are destroyed if they choose to withdraw from the study after the interview. However, I will explain to participants that data obtained during focus groups makes identification and destruction of their individual material impossible. It is impossible for group participants to withdraw their materials, even if they withdraw from participation, as their contributions cannot be separated from the total group process.

Appendix B.1

Informed Consent Form - Individual

Dear Participant,

My name is Roger Sideman and I am a Master's student at Smith College School for Social Work in Northampton, Massachusetts. You are being asked to participate in a research study that explores how people with ADHD experience their time spent in nature. The findings from this study will be included in my thesis and possibly future presentations or publications.

This consent form includes information about this study. You were selected as a possible participant because you are a full-time college student aged 18 to 25, are not pregnant, and have been diagnosed with ADHD by a licensed mental health professional. Your involvement in the study consists of an individual interview. The contents will be audio taped and later transcribed by me. The interview will take approximately 45 minutes of your time.

Possible risks to you of involvement in this study include the potential emotional discomfort in talking about how ADHD has affected you. The study has been designed to minimize any risk to you from your participation and you will be provided with a list of community resources before you leave.

Possible benefits from your involvement in this study are that you may gain new insights by talking about how your time spent outdoors affects your ability to concentrate. This information may help you learn how concentration is affected by your relationship with the outdoors. Your contributions will provide important information that may be helpful in furthering the knowledge of social work within both the professional and educational spheres. For your participation, you will be given dinner and a \$10 gift card. These benefits will be yours once you sign the consent form, regardless of whether you choose to respond to any or all of the questions.

The information you provide and the records of this study will be kept strictly confidential. Any identifying information will be removed from all materials. I will use pseudonyms in the transcripts. Some illustrative quotes will be used in the final report, but will be included without identifying information and disguised when necessary. Demographic questionnaires, tapes, transcripts, and other research records will be kept in a locked file, and all electronic information will be coded and secured using a password-protected file. Federal law requires that I keep the material for three years. After three years, it will be destroyed. If materials are needed beyond three years, I will continue to keep them secure, and destroy them when they are no longer needed. My Research Advisor will see the data only after all identifying information has been removed.

The decision to participate in this study is voluntary. You may refuse to answer any or all questions without consequence. It is possible to withdraw from the study at any time leading up to the meeting date, or at any time during the meeting. You may withdraw from the study at any point up to April 15, 2012. All materials pertaining to you will be destroyed should you choose

to withdraw. However, information obtained during focus groups makes identification and destruction of their material impossible because it is part of the group process.

If you have any questions or concerns that occur as a result of your participation, please contact me at **(personal information deleted by Laura H. Wyman, 11/30/12)**. You may reach the Chair of the Smith College School For Social Work Human Subjects Review Committee at 413-585-7974.

YOUR SIGNATURE INDICATES THAT YOU HAVE READ AND UNDERSTAND THE ABOVE INFORMATION AND THAT YOU HAVE HAD THE OPPORTUNITY TO ASK QUESTIONS ABOUT THE STUDY, YOUR PARTICIPATION, AND YOUR RIGHTS, AND THAT YOU AGREE TO PARTICIPATE IN THE STUDY.

Sincerely,

Roger Sideman, researcher

Date

Participant Signature

Date

Appendix B.2

Informed Consent Form - Group

Dear Participant,

My name is Roger Sideman and I am a Master's student at Smith College School for Social Work in Northampton, Massachusetts. You are being asked to participate in a research study that explores how people with ADHD experience their time spent in nature. The findings from this study will be included in my thesis and possibly future presentations or publications.

This consent form includes information about this study. You were selected as a possible participant because you are a full-time college student aged 18 to 25, are not pregnant, and have been diagnosed with ADHD by a licensed mental health professional. Your involvement in the study consists of a group discussion. The contents will be audio taped and later transcribed by me. The interview will take approximately 45 minutes of your time.

Possible risks to you of involvement in this study include the potential emotional discomfort in talking about how ADHD has affected you. Additionally, confidentiality will be limited for focus group participants because others in the group will hear everyone's answers, and I will not be able to control what is revealed outside of the group. The study has been designed to minimize any risk to you from your participation and you will be provided with a list of community resources before you leave.

Possible benefits from your involvement in this study are that you may gain new insights by talking about how your time spent outdoors affects your ability to concentrate. This information may help you learn how concentration is affected by your relationship with the outdoors. Your contributions will provide important information that may be helpful in furthering the knowledge of social work within both the professional and educational spheres. For your participation, you will be given dinner and a \$10 gift card. These benefits will be yours once you sign the consent form, regardless of whether you choose to respond to any or all of the questions.

The information you provide and the records of this study will be kept strictly confidential. Any identifying information will be removed from all materials. I will use pseudonyms in the transcripts. Some illustrative quotes will be used in the final report, but will be included without identifying information and disguised when necessary. Demographic questionnaires, tapes, transcripts, and other research records will be kept in a locked file, and all electronic information will be coded and secured using a password-protected file. Federal law requires that I keep the material for three years. After three years, it will be destroyed. If materials are needed beyond three years, I will continue to keep them secure, and destroy them when they are no longer needed. My Research Advisor will see the data only after all identifying information has been removed.

The decision to participate in this study is voluntary. You may refuse to answer any or all questions without consequence. It is possible to withdraw from the study at any time leading up

to the meeting date, or at any time during the meeting. However, after the discussion begins, it will not be possible to remove any contributions you made before withdrawing, since I won't be able to easily identify your particular comments. You may withdraw from the study at any point up to April 15, 2012.

If you have any questions or concerns that occur as a result of your participation, please contact me at **(personal information deleted by Laura H. Wyman, 11/30/12)**. You may reach the Chair of the Smith College School For Social Work Human Subjects Review Committee at 413-585-7974.

YOUR SIGNATURE INDICATES THAT YOU HAVE READ AND UNDERSTAND THE ABOVE INFORMATION AND THAT YOU HAVE HAD THE OPPORTUNITY TO ASK QUESTIONS ABOUT THE STUDY, YOUR PARTICIPATION, AND YOUR RIGHTS, AND THAT YOU AGREE TO PARTICIPATE IN THE STUDY.

Sincerely,

Roger Sideman, researcher

Date

Participant Signature

Date



RESEARCH STUDY ON EFFECTS OF NATURE ON ADHD

STUDY:

Exploring the effects of natural settings on symptoms of ADHD.

Participation involves being a part of a focus group on-campus.

Interviews will be 45 minutes.

WHO IS ELIGIBLE:

Students ages 18 - 25 with a
diagnosis of ADD or ADHD

PAYMENT:

Participants will receive a free meal PLUS
a choice of: \$10 coffee store card
or iTunes gift card

CONTACT:

Roger Sideman,

Smith College School For Social Work graduate student

rsideman@smith.edu

Appendix D

Screening and Demographic Questions

The following questions will be asked during a phone screening call. The information collected will be kept confidential and held in a secure location.

- 1) What is your name?
- 2) What is your mailing address?
- 3) What is your phone number?
- 4) What is your email address?
- 5) Are you pregnant?
- 6) Are you enrolled in school full-time taking 12 credits?
- 7) Have you received a diagnosis of ADHD from a licensed mental health professional?
- 8) Do you current have a diagnosis related substance use such as drug or alcohol dependence?

Appendix E

Interview Questions

- 1) Do you notice any changes in your stress levels or ability to relax when you spend several hours engaged in unfocused activities in the outdoors? (With "unfocused" defined as unstructured time such as walking, hiking, camping, swimming, bike riding, etc.) Do you notice changes in your energy level? How about emotional changes? Do you notice changes in your ability to focus and pay attention?
- 2) Have you had any nature experiences, such as camping, hiking, fishing, biking, etc. in a State park, National park, or other natural area? If so, what happened? Did you notice changes to your mood or your behavior during your time there?
- 3) Do you feel a difference in mood or behavior when you are indoors vs. outdoors? Could you compare being inside a windowless room with artificial lighting versus a room with windows and views of "wild" things such as flowers, trees, animals, etc.?

Appendix F

Human Subjects Review Approval Letter



School for Social Work

Smith College

Northampton, Massachusetts 01063

T (413) 585-7950 F (413) 585-7994

March 5, 2012

Roger Sideman

Dear Roger,

You did a very nice job on your revisions. Your project is now officially approved by the Human Subjects Review Committee.

Please note the following requirements:

Consent Forms: All subjects should be given a copy of the consent form.

Maintaining Data: You must retain all data and other documents for at least three (3) years past completion of the research activity.

In addition, these requirements may also be applicable:

Amendments: If you wish to change any aspect of the study (such as design, procedures, consent forms or subject population), please submit these changes to the Committee.

Renewal: You are required to apply for renewal of approval every year for as long as the study is active.

Completion: You are required to notify the Chair of the Human Subjects Review Committee when your study is completed (data collection finished). This requirement is met by completion of the thesis project during the Third Summer.

Good luck with your project!

Sincerely,

A handwritten signature in black ink, appearing to read "David L. Burton". The signature is written in a cursive style with a long horizontal flourish extending to the right.

David L. Burton, M.S.W., Ph.D.
Chair, Human Subjects Review Committee

CC: Christina Papanestor, Research Advisor

Appendix G

Community Referrals

Berkeley Therapy Institute

Community mental health clinic in Berkeley includes psychologists, psychiatrists, and family therapists.

Bti.org

Phone: 510-841-8484

Association for Higher Education and Disability (AHEAD)

AHEAD is the foremost professional organization that addresses full participation of individuals with disabilities in higher education. Through workshops, publications, and consultation AHEAD disseminates information and provides exemplary practices for professionals in the postsecondary setting.

www.ahead.org

The George Washington University HEATH Resource Center

Heath is an online clearinghouse on postsecondary education for individuals with disabilities. It serves as an information exchange about educational support services, policies, procedures, adaptations, and opportunities at American campuses, career-technical schools, and other postsecondary training entities.

AskHEATH@gwu.edu

Phone: (202) 973 -0904

Children and Adults with Attention-Deficit/Hyperactivity Disorder (CHADD)

CHADD is a national association that provides education, advocacy and support for persons with AD/HD. A section on the web site is devoted to AD/HD in adulthood (see Especially for Adults with AD/HD.) In addition to the Web site CHADD also publishes a variety of printed materials to keep members and professionals current on research advances, medications and treatments affecting individuals with AD/HD.

Chadd.org

LD OnLine

LD OnLine provides accurate and up-to-date information and advice about learning disabilities and ADHD. The site features helpful articles, monthly columns by noted experts, first person essays, a comprehensive resource guide, very active forums, and a Yellow Pages referral directory of professionals.

www.ldonline.org

National Center for Learning Disabilities (NCLD)

NCLD provides essential information to parents, professionals and individuals with learning disabilities, promotes research and programs to foster effective learning and advocates for policies to protect and strengthen educational rights and opportunities.

www.nclld.org

Stanford University Schwab Learning Center

The SLC offers students with learning disabilities and attention-deficit hyperactivity disorder a wide array of state-of-the-art services and resources to enrich the learning and research opportunities at Stanford.

The SLC offers consultations and one-on-one learning strategies refer to techniques or methods students use to learn, study, or take tests.

Learning strategy sessions are for students diagnosed with a specific learning disability or ADHD. A student meets individually with a SLC Learning Specialist; strategies covered depend on the student's particular learning needs.

<http://studentaffairs.stanford.edu/oea/schwab>
563 Salvatierra Walk, Stanford, California
650-723-1066

UC Berkeley Disabled Students Program

Offers academic advising and other resources for students with ADHD.

dsp.berkeley.edu

260 César E. Chávez Student Center, #4250
Berkeley, CA 94720-4250
Phone: 510-642-0518