

EFFECTS OF NATURE EXPOSURE

ON STUDENTS: A CASE STUDY

A Dissertation

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Abstract

This is a case study that examines what effect a short walk in nature might have upon a small group of sixth grade students. Members of the participant group had previously been diagnosed with attention deficit disorder (ADHD). A review of past studies has suggested a connection between an enhanced ability to focus attention on tasks, such as those in an academic setting, and a brief exposure to a natural setting. This study primarily utilizes observation of the participant group under different circumstances, including that of being taken for a short walk in nature, to determine if behavioral changes take place and within what context. A detailed description of the observations is included to afford the reader the opportunity to reach his/her own conclusions.

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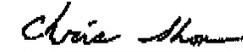
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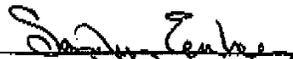
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This dissertation has been approved and accepted by the faculty of the Education Department, Carson-Newman University, in partial fulfillment of the requirements for the degree, Doctor of Education.

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CHAPTER 1: Introduction

Introduction and Background

Over the last fifty years there has been a marked shifting of the emphasis of modern life in the developed world away from nature and spending time outside and more toward technology and being inside (Louv, 2008). This coincides with an increase in several human maladies including obesity and negative behavior issues. It also seems to have affected the way we think. In her book, *The Ecology of Imagination in Childhood*, Edith Cobb (1993) describes how a connection with nature is vital to the creative process. The decline of connectedness to the outside and nature has also been linked to a rise in attention deficit hyperactivity disorder or ADHD (Louv, 2008). Humans evolved in the natural world and are a part of it. When they distance themselves from nature, intentionally or otherwise, some of the natural ability to cope with negative issues is lost. This especially affects those who are already suffering from issues like ADHD (Taylor & Kuo, 2004).

The prevalence of focus issues in the classroom, most notably ADD/ADHD has been increasing worldwide. American research on ADD/ADHD has dominated the field over the last 40 years and so it seemed that perhaps something in the culture of America was responsible, but this has turned out not to be the case (Faraone, Sergeant, Gillberg, & Biederman, 2003). The researchers hypothesized that other countries may have similar numbers of childhood ADD/ADHD sufferers to the United States, but that other countries were diagnosing those individuals differently. Once the data was analyzed using the same criteria, the numbers were remarkably similar. Their analysis covered 50 studies, 30 outside of the United States, from 1982 to 2001. This indicates that the problem is one that is very prevalent throughout the world and not just in the United States. The increase in the prevalence of ADD/ADHD worldwide has coincided with an increase in the time that people spend inside.

The theoretical foundation for this case study is attention restoration theory (ART). Stephen Kaplan (1995) described the restorative benefits of spending time in nature for people who are

experiencing mental fatigue, also called attention fatigue. Attention fatigue occurs when a person's attention is directed at one task or specific stimuli for extended periods of time, such as in a traditional classroom. Directed attention is difficult to maintain, but is central to focusing and requires a concerted effort. When forced to focus on one thing, the mind must shut out all other stimuli competing for its interest. The individual eventually finds it hard to concentrate, resulting in attention fatigue and the associated feelings of anxiety and distraction (Feltsen, 2008; Tennessen & Cimprech, 1995).

The symptoms of attention fatigue caused by directed attention closely mimic those of ADD/ADHD. Kaplan believed that there must be a common cause to both maladies, although unlike ADD/ADHD, attention fatigue is a short term condition.

Research Problem

As a teacher in the public school system, the researcher has noticed that the prevalence of the diagnosis of ADD/ADHD has been increasing every year. Another observation that the researcher has made is that many students spend very little time outside in a natural setting. Could there be a connection? After reading about how others have questioned this possible connection (Kaplan, 1995; Kuo & Taylor, 2001; Louv, 2008), the researcher decided to examine this problem more thoroughly in a small group of individual students. A case study of a group of students, formally diagnosed with ADD/ADHD, who spend the school day inside with little connection to nature, would be an interesting way to approach this problem. Observing the students in their usual class and then observing them during and after taking walks in nature might offer some insight into whether there might be a change in their ability to focus and concentrate on their work once they return to the classroom.

Purpose of the Study

The purpose of this study was to examine a group of individual students, who have been diagnosed with ADD/ADHD and also spend very little time in nature. They are inside during the entire school day and spend evenings with electronic media. The diagnosis of ADD/ADHD indicates a lack

of ability to focus and concentrate (Gorden, 2008). This has been connected to attention fatigue. Persons with attention fatigue have been shown to benefit from the restorative properties of nature (Kaplan, 1995).

Kuo and Taylor (2004) theorized that exposing young people to nature during the school day could help to ameliorate the symptoms of attention fatigue which they believed could lead to better focus in the classroom. This researcher proposed a case study observing students with ADD/ADHD before, during, and after a brief exposure to nature. A case study is appropriate for this population since one of the hallmarks of ADD/ADHD is that the symptoms are not consistent (Gorden, 2008) and observing behavior can be enlightening. Observing the participants over several weeks under different conditions, including walks in nature, gave the researcher more of a clear understanding about what might affect their behavior. The purpose of the study is to add an additional piece to the puzzle about the possible connection between a lack of exposure to nature and ADD/ADHD.

Research Question

Attention fatigue came to public notice when researcher Stephen Kaplan (1995) first discussed the restorative benefits of spending time in nature for people who were having trouble concentrating and focusing after directing their attention to a specific task. Attention fatigue occurs when a person's attention is intentionally directed at one task or specific stimuli and forced to focus on it for extended periods of time, such as in a traditional classroom. When forced to focus on one thing, the individual must shut out all of the stimuli competing for his/her interest. He/she eventually finds it hard to focus and control impulses and becomes anxious and distracted. The symptoms of attention fatigue caused by directed attention are very similar to those of ADD/ADHD. The restorative benefits of exposure to nature can have a positive effect on attention fatigue (Hartig, Mang, & Evans, 1991). Would a group of children diagnosed with ADD/ADHD exhibit behavioral changes after a brief exposure to natural surroundings?

Rationale for the Study

There have been many studies that have shown a connection between the restorative benefits of nature and a reduction in attention fatigue (Kaplan & Kaplan, 1989; Kaplan, 1995; Hartig et al., 1997). Further studies have shown that this connection can be applied to children as well (Kuo, 2001; Kuo & Taylor, 2004). However, there have been no case studies that have looked specifically at a group of students who are particularly sensitive to attention fatigue, such as those with ADD/ADHD. The researcher believes that a case study needed to be done to add to the growing body of knowledge in this area.

The Researcher

The researcher is a veteran teacher with 17 years classroom experience, in both elementary and middle school. The majority (15 years) of this experience has been in visual arts. The art classroom offers a unique opportunity to observe the interaction of students without the usual structure of the typical academic classroom. The researcher has witnessed the social and academic struggles of children with ADD/ADHD in the classroom.

In addition to an academic interest, the researcher has two nephews who have been diagnosed with ADHD and so has a personal interest in studying alternatives to pharmaceuticals for managing the symptoms of the disorder. As an environmental advocate, avid hiker and backpacker, the connection to the natural environment is also very important to the researcher.

Definition of Terms (specific to study)

Attention Deficit Disorder: Medical diagnosis that involves a lack of ability to focus and concentrate (Gorden, 2008).

Attention Deficit/Hyperactivity Disorder: Medical diagnosis that combines a lack of ability to focus with impulsivity and hyperactivity (Gorden, 2008).

Attention Fatigue: Mental fatigue associated with directed attention, often accompanied by impulsive

behavior, lack of focus, and inability to concentrate (Kaplan, 1995).

Restorative Benefits: Rejuvenating effect on the brain allowing for more focus (Kaplan, 1995).

Natural Environments: Outdoor settings altered little or not at all from that found in nature.

Built Environments: Man-made structures, can be indoors or outdoors.

Eco-psychology: Newly emerging pseudo-science that combines some elements of ecology with those of psychology (Roszak, 1992).

Summary

This chapter introduces the concept of a correlation between a lack of exposure to nature and the symptoms of ADD/ADHD. This research study is a case study of a group of students who have been diagnosed with ADD or ADD/ADHD. By definition, these students have attention deficits (Gorden, 2008). Studies have shown that individuals suffering from attention deficits often have attention fatigue (Kaplan, 1995; Hartig et al., 1997). Other studies have shown that nature can have a restorative benefit for attention fatigue (Kuo, 2001; Taylor & Kuo, 2009). The researcher sees a link between these ideas and this link is the reason for undertaking the study. Since attention deficits from attention fatigue benefit from exposure to nature, could attention deficits from other causes be affected as well? Is there a real-life setting in which these theories come together? A case study observing students with ADD/ADHD before, during, and after an exposure to nature could provide additional information toward answering this question.

The observed behavior of these students might be different or might not be affected at all after exposure to nature. The struggles of students with ADD/ADHD can have a profound effect, not only on their lives, but on the lives of those around them. A study that could possibly provide more data in this area, including close observation of an affected group is the rationale discussed in this chapter.

Also included in this chapter is a list of terms that relate to the study with definitions applicable to the proposed study.

CHAPTER 2: Review of the Literature

Introduction

“Everybody needs beauty as well as bread, places to play in and pray in, where nature may heal and give strength to body and soul” John Muir (Highland, 2001, p. 115). John Muir understood the restorative benefits of spending time in nature. Research across many disciplines has provided support for the theory of a genetically based connection with nature (Wilson, 1984). Referred to as biophilia, this connection has been shown empirically to increase productivity of the workforce, reduce health issues in prisons, and promote healing of patients in hospitals (Kahn, 2001). Over one hundred studies have shown that one of the main benefits of spending time in nature is the reduction of stress (Louv, 2008). Humans have always been a part of the natural world. It is only recently, within historic times, that the species has distanced itself from nature. This can be explained as progress away from dangerous interactions with the unpredictability of nature. While this is understandable, an unintended consequence has been an increase in the amount of stress experienced by members of the human race due to the lack of time spent in nature.

Spending time outside without a specific agenda seems to be disappearing from the regular day of today’s school aged children. More and more, children are shuttled in climate controlled cars from inside their homes to school buildings which are increasingly designed to resemble protected fortresses with high windows and solid doors. While the intention of newly designed school buildings is to keep children safe from people with destructive agendas, it also keeps children from their own natural world. Separating children from nature seems to be taking a toll on their imaginations and their ability to concentrate on tasks for extended time periods (Cobb, 1993).

Richard Louv, in his landmark 2008 book, *Last Child in the Woods*, connects the decline of time spent in nature with a rise in Attention Deficit Disorder (ADHD). He believes that as humans we evolved to live in the natural world as part of nature. When we separate ourselves from the sights,

sounds, and smells of the real world, something in our ability to cope seems to be missing. This becomes particularly pronounced when associated with an individual who suffers from the symptoms of childhood ADD/ADHD.

Modern disconnection with nature. The dictionary defines nature as the elements of the natural world, such as mountains, trees, animals, or rivers (Webster, 1998), but it can also refer to the out-of-doors. Nature can be a wild and natural setting or one that has been tamed, such as a park or a garden. Elements of nature can be brought inside in the form of potted plants, fountains, terrariums, and aquariums. Nature can even be accessed from a view to the outside through a clear window. The definition of nature changes subtly with each generation as more and more of the natural world is tamed in the name of progress. Adult definitions of nature are based on what was experienced as children (Kahn, 2013). With each subsequent generation, a shift away from a wild, untamed, and sometimes dangerous view of nature is inevitable as more and more of the planet is explored and changed by humans seeking to control their environment instead of being controlled by it.

Over the last fifty years there has been a definite shift of the emphasis of modern life in the developed world away from the natural world outside, and more toward technology, and the man-made world inside (Louv, 2008). This coincides with an increase in several human maladies including obesity and negative behavior issues. It also seems to have affected the way we think. In her book, *The Ecology of Imagination in Childhood*, Edith Cobb (1993) describes how a connection with nature is vital to the creative process. Through hundreds of hours of observation of children, along with her extensive collection of the biographies and autobiographies of creative people, she has documented the connection. She believes that without early childhood experiences with nature and the natural world, there is an inevitable reduction in the imagination of the adult.

In a great many areas of the technologically advanced world there has been an ever increasing trend away from the farm and farming. This also represents a trend away from living in the country

and playing and working outside. This becomes obvious when talking with children about the natural connections between animals and plants and their own food. Their families rarely grow their own fruits or vegetables and many have never even picked wild berries. Meat eaters no longer associate the animal with what they see on their plates. It has become much more sterile and businesslike (Louv, 2008). Plants and animals are no longer part of their daily lives, but have become somehow separate.

The naturalist Edward Wilson believed that the more familiar we are with other species, the more we will care about them (Kellert, 1993). Without the daily connection, other living things can seem superfluous and not worth contemplation. Coupled with the anthropomorphizing of animals through film, the natural world can seem to be a confusing place. Children in urbanized areas of more developing countries seem to be more aware of what they are missing. These children are no longer able to experience nature for themselves, but still remember it, or at least hear the stories. When asked what they would like to have more of in their worlds, they almost invariably say trees and green spaces in which to play (Chawla, 2002). The more time that children spend inside being entertained by two dimensional media, the further from natural they become. We are only beginning to understand the human mind and how it has evolved over time from its primal ancestral manifestation (Panksepp, 2000), but we do know that it evolved in response to the natural world, since that was the only world available.

In the past, children connected to nature often because they did not have any choice. They worked in agriculture fields and played in the woods surrounding their homes. Their play was unstructured by adults and they used whatever objects they could find as toys and tools for building toys. Outdoor unstructured play was the norm, not because it was considered to be the healthiest option for the children, but because it was the only option. However, outdoor unstructured play is no longer a routine part of the lives of most children in the modern world. Children who are not inside playing on video screens often become backseat children (Karsten, 2005). Karsten did a study in

Amsterdam based on oral histories, statistical and archived research, and observation. She wanted to determine the truth in anecdotal accounts of how much greener the lives of children were in the previous generation. She found this to be true especially in urbanized areas and for the socioeconomically disadvantaged.

Another aspect of reducing the amount of unstructured outdoor play is that it can be detrimental to the natural development of young children (Little & Weyer, 2008). There are many benefits from play, especially in outdoor play. The challenge of risk taking in outdoor play gives young children a chance to test their own limits. In western society, more and more of the risk is removed from the environments of young children and the evidence indicates that this does not bode well for their futures. Without the ability to play freely and take risks in early childhood, not only are motor skills compromised, but so too is their confidence. It is natural for young children to want to take physical risks. If adult caregivers limit their ability to try new things in outdoor play while still young, they may be tempted later to try risky behavior without any understanding of their own limits. While adults often encourage children to take risks mentally and discover answers to whatever they do not know, they are less likely to encourage taking physical risks. Unfortunately, if the children were discouraged from taking those risks early, they may not be able to properly do so later.

When discussing the disconnection of children from nature, it is important to distinguish the type of contact involved (Kahn & Kellert, 2002). Direct contact with nature includes actual physical contact with creatures or plants in a relatively natural setting. An area does not need to be completely wild to fit into the direct contact context, but the overall feel should be one of natural habitats. Natural explorations in parks and gardens can be considered direct contact. Indirect contact involves interacting with natural creatures and plants in a man-made setting. House plants, pets, and zoos are examples of indirect contact with nature. The third category is vicarious contact. Vicarious contact would include hearing or reading about nature, or seeing relevant pictures or movies.

The greener an area in which a person lives shows a direct correlation with how healthy that person is. In a study done in England, the mortality across all groups under age 40 who lived in greener areas with more direct exposure to nature was significantly lower for all causes, except cancer and self harm, independent of economic status (Mitchell & Popham, 2008).

In the first large epidemiological study of its kind, researchers in the Netherlands looking for empirical evidence for anecdotal reports of increased health benefits of living near green spaces, looked at medical records across all socioeconomic groups and all age groups (Maas et al., 2009). They examined the morbidity rates for disease clusters and compared those to how much green space existed in the patients' living environments. They found that those living within a one kilometer radius of green spaces were healthier. The relationship was strongest for children and lower socioeconomic groups, especially those with anxiety and depression. The researchers called for more studies to be done on the mechanisms involved since they only looked at the data itself.

Childhood health problems possibly associated with lack of nature. The decline of connectedness to the outside and nature has also been linked to a rise in many negative health problems for today's children including obesity, hypertension, diabetes, and emotional and mental health issues such as Attention Deficit Hyperactivity Disorder or ADHD (McCurdy, Winterbottom, Mehta, Roberts, 2010). The current generation of adolescents is in danger of becoming the first group of adults who have a shorter lifespan than their parents. They are at risk for higher incidence of many chronic conditions that have been linked to a sedentary lifestyle. In the United States of America, the current rate of childhood obesity is at 17%. This translates to roughly 12.5 million obese children in one of the richest, most highly educated countries in the world. There has also been a marked rise in childhood asthma, and vitamin D deficiency. A dramatic increase in emotional, behavioral, and mental health issues such as all forms of Attention Deficit Disorder has also been noted. Experts in the field blame a shift toward spending more time indoors with electronic media and less time in a natural environment

(McCurdy et al., 2010).

According to the American Academy of Pediatrics (AAP) (Giddings et al., 2006) parental health status is a major factor in influencing the behavior and habits of children. Their statistics show that in 2006, 40% of adults in the United States reported no physical leisure time activities. This lack of physical leisure time has led to a growing disconnect with nature and coincides with a dramatic rise in the use of electronic media. The innovative entertainment that the latest technology offers can be a dominant force in tempting young people away from outdoor time. In the same report, the AAP stated that 21% of children and adolescents, when not in school, chose to play video or computer games for more than 3 hours a day. When coupled with the reported 3 hours of television watched per day, the time spent in quiet, indoor settings with screens can reach staggering numbers. Thirty two percent of children between ages two and seven have television sets in their bedrooms and that number climbs to 65% for the eight to eighteen year old group (Giddings et al., 2006). These hours are not spent on unstructured play which would allow the children to use creativity and imagination while also building manual dexterity. Healthy brain development needs unstructured play. Children in unstructured play learn to work in groups, to share, to negotiate, and to resolve conflicts.

The enactment of No Child Left Behind (NCLB), has prompted schools to increase instruction time spent on Mathematics and Language Arts often at the expense of outdoor breaks. Thirty percent of Kindergarten classes no longer have recess in order to have more time for academics (Giddings et al., 2006). One of the insidious effects of this trend away from outdoor physical activity is the alarming increase in the diagnosis of children with Attention Deficit Disorders (ADD).

Richard Louv (2008) believes that since humans evolved in the natural world, that we are a part of it. He believes that when we distance ourselves from nature, intentionally or otherwise, we lose some of our ability to cope with negative issues. This especially affects those who are already suffering from issues like ADD. The prevalence of ADD has been increasing worldwide throughout developed

countries. American research on ADD has dominated the field over the last 40 years and so it might seem that perhaps something in the culture of America was responsible, but this has turned out not to be the case (Farone, Sergeant, Gillberg, & Biederman, 2003). The researchers hypothesized that other countries may have similar numbers of childhood ADD sufferers to those of the United States, but that other countries were diagnosing those individuals differently. Once the data was analyzed using the same criteria, however, the numbers were remarkably similar. Their analysis covered 50 studies, 30 outside of the United States, from 1982 to 2001.

American children are increasingly being diagnosed with ADD, but the statistics are not the same across all demographics. Although there is a very high rate of behavioral problems among affluent European-American adolescents, these issues are often expressed in the forms of depression and substance abuse (Luthar, 2013). The rate of low income, inner city African-American children being diagnosed with Attention Deficit Hyperactivity Disorder (ADHD) which is a form of ADD, seems to be increasing much faster (Diaz, 2011). According to the Center for Disease Control (2011), boys are more than twice as likely to be diagnosed with ADHD than girls. African-American children are more likely than those of European descent to be diagnosed, and Latino children less likely than either group. Interestingly, when statistics are broken down by family structure, the likelihood of a diagnosis of ADHD in children being raised by a mother with no father was much higher than in other groups, surpassed only by a child being raised without either (CDC, 2011).

Attention deficit disorder. Brain-imaging studies have allowed for many psychiatric illnesses to be shown as having a real and physical explanation (Amen, 2015). This is true for anxiety, depression, addictions, and ADD/ADHD. Often this gives credence to the symptoms and can be important for family members and other stake holders to realize that the afflicted individual requires assistance and intervention and not punishment. Dr. Amen (2015) has identified seven different types of Attention Deficit Disorder. These are all relevant to three common neurotransmitters, Dopamine,

Serotonin, and GABA. An important distinction with this approach is that depending on the results of the brain-imaging, levels of one neurotransmitter, for example Serotonin, may be high while another, for example Dopamine, may be low. In other cases, with similar outward symptoms, the reverse might be true. It is not always the same cause. Since each of the seven types of ADD relate to specific regions of the brain and also to deficits (or an overabundance) of one of the neurotransmitters, his approach is often a four part process that includes possible pharmacological interventions to normalize the neurotransmitters, along with diet, supplements, and exercise. Often his pharmacological approach is not the standard stimulant medication as this would only work with specific deficiencies. Prescribing exercise and meditation is common throughout all types of diagnosis.

Most other clinicians have divided the disorder into the two categories of Attention Deficit, and Attention Deficit with Hyperactivity. Without the specifics of what is the actual cause of the symptoms, a standard pharmacological approach is often affected. As mentioned before with the work of Dr. Amen (2015), since the symptoms can be similar for very different root causes, the pharmacological response may be the exact opposite of what the patient needs; like throwing fuel on a fire. While it may seem counter intuitive, a stimulant is sometimes used for treating the hyperactive component of ADHD and for some it is very effective, but not all. For others, that have not been diagnosed using brain-imaging techniques, the results can be frustrating.

ADD/ADHD is a specific medical condition that is not a function of improper parenting. While the symptoms of impulsivity, lack of ability to focus, and hyperactivity may seem common, the diagnosis for childhood ADHD requires very specific criteria to be met and is made by a mental health professional. The symptoms must have been present for at least six months and must have appeared before the age of seven. The symptoms must be excessive, meaning beyond what would be expected for the age of the child. They must be long term and not in response to a recent change in the child's life, and they must be pervasive, affecting at least two aspects of the child's life. Hyperactive behavior

that is witnessed only at school and not in the home, for example, would not meet the criteria. Mental health professionals would first rule out other factors such as other medical or mental conditions. They would then receive input from adults with first-hand knowledge of the case, such as parents and teachers. While brain research has shown a physical difference in the right prefrontal cortex of individuals diagnosed with ADHD, this is not part of the usual diagnosis (Molle, Marshall, Pietrowsky, & Lutzenberger, 1995), although this does relate to the later discussion of treatments.

Children who are diagnosed with ADHD are not just at risk of losing out on age appropriate academic achievements. They also have fewer close friends when compared to their non ADHD peers (Bagwell, Molina, Pellham, & Hoza, 2001). The long term effects on social functioning of symptomatic children were more pronounced as they became adolescents. This is a concern, given the importance of peer acceptance of children in this age group. The negative effects were still seen within the adult population who had been diagnosed as children with ADHD (Kessler et al., 2006). The adults were found to have higher incidence of addiction problems than the general population. There is also a profound effect on the families and communities of the effected individuals and these are expressed differently at different stages in their lives (Harpin, 2005).

In the modern world, children spend less time in nature than they have in the past. This lack of connection with nature has coincided with an increase in childhood maladies including obesity, diabetes, hypertension, attention deficit disorder, and attention deficit hyperactivity disorder. These last two disorders can have a very real negative effect on the academic experience for young students leading to life long problems (Spira & Fischel, 2005).

In publications recommending natural approaches to dealing with ADD/ADHD, a healthy, natural diet along with plenty of outdoor exercise is often recommended (Amen, 2015; Gorden, 2008; Kemper, 2010; Taylor, 2007). While team sports can teach important social skills, most would recommend that children begin with simple walks in green spaces for the restorative benefits that

nature can bring without the additional component of team members and rules of play. While these interventions can help at home, they need to be used in the school environment as well. Very often the ADD/ADHD child faces major challenges in the traditional academic setting, beginning as early as preschool.

Challenges in academic setting for ADD child. It is important to catch ADD/ADHD early. There is a great deal of learning that takes place in the preschool classroom and if a student misses out on these critical lessons there are possible lifelong negative consequences (Spira & Fischel, 2005). It is in a preschool setting that children learn the basics of attending school, the foundation for all academic learning to come. They learn how to focus their attention on teacher directed learning and they learn how to interact in an appropriate way with their peers. It is at this level that they internalize the ability to follow classroom rules, such as staying seated and raising one's hand to speak. Children who are experiencing issues such as impulse control, shortened attention span, and hyperactivity may be missing out on these valuable lessons. These early difficulties can presage more serious problems for subsequent school years.

Preschool children with ADHD are at a much greater risk than other children their age for social ostracism and familial issues, as well as academic ones. The parents of these children were much less able to cope with the stress of their offspring's behavior than other parents, going so far as to display negative attitudes towards their own children (DuPaul, McGoey, Eckert, & VanBrakle, 2001).

Understandably, professionals (medical and educational) are reluctant to label children in preschool as ADD/ADHD with the thought that the behavior may be transient or a possible variance of normal behavior (Lavigne et al., 1996). The problem becomes much worse, however, if the diagnosis is delayed. Fortunately, if the diagnosis is done by trained professionals, using structured diagnostic protocol, there is little chance for misdiagnosing an active, otherwise normal child (Lahey et al., 1998). Using the DSM-IV (Diagnostic and Statistical Manual of Mental Disorders, fourth edition), it becomes

clear that the behavior and academic issues that the ADD/ADHD child is experiencing are very different from those issues that other children experience.

Children who are afflicted with ADD/ADHD but not diagnosed as such preschool, often begin to fall behind academically in Kindergarten. While Kindergarten is not considered by most to be a rigorous academic setting, it is increasingly becoming important as a base for all subsequent learning.

Individuals with ADD/ADHD, who were diagnosed much later in life, share some common traits. They are much more likely to have repeated a grade. They often were considered underachievers in school and under performers in the workplace. Their resumes often list many jobs as they changed employment regularly. The commonalities even extend to safety concerns as this population is at a much greater risk for moving violations, including speeding, and they are more likely to be involved in traffic accidents. These accidents are also more likely to be severe (Gorden, 2008).

Young students today can spend up 40 to 50 hours a week in a school or other care facility. These facilities need to include as much opportunity for outdoor time as possible since being surrounded by natural vegetation, such as in a garden, enhances the student's ability to direct his/her attention and therefore to learn more effectively (Mancuso, Rizzitelli, & Azzavello, 2006).

Natural treatments for ADD/ADHD. While ADD/ADHD is often automatically treated with medication, there are natural options that have been gaining attention over recent years due to possible side effects of the available medications, even the newest ones. These side effects can include everything from mood swings to adverse physical development (Gordon, 2008). One treatment is to change the diet and lifestyle of the patient. Changes in diet include drastically reducing sugar intake, cutting down on processed foods, and cutting out chemical additives such as food coloring. These changes alone can have a dramatic effect on the ADD child, however it requires a family effort. Since the entire family unit is affected by having even one member exhibit the symptoms of ADD/ADHD (DuPaul, 2001), many families are willing to try. According to Dr. Gorden (2008), many of the

symptoms of ADD/ADHD can be made worse by lack of sleep, structure, and exercise and especially by bad nutrition. Often the behavioral issues have led to strained relationship within the family and after the symptoms are under control, family therapy may help to repair these relationships (Amen, 2015).

Dr. Kathi Kemper (2010) also advocates for addressing ADD naturally. In her practice she has found that improving the quantity as well as the quality of sleep for her ADD patients can resolve problems very quickly. She recommends optimizing daytime routines with suggestions about vigorous exercise early in the day, avoiding caffeine, and reducing the use of electronic media. Regular sleep routines such as going to bed at the same time, drinking herbal tea, having a light protein rich snack, and possibly taking a warm bath. Her final suggestion regarding sleep is to improve the environment for the ADD/ADHD afflicted individual. The room should be cool and dark without clutter. The television should be removed and children should not do their homework while sitting in bed.

Green space is offered as an alternative in *Complementary and Alternative Therapies for Pediatric Attention Deficit Disorder: A Descriptive Review* (2012). Spending time in green spaces that include trees and grasses is an exposure form of treatment that shows promise, but that needs further study in order to determine the amount of exposure needed and the length of duration of cognitive improvement (Searight, Roberson, Smith, & Searight, 2012).

While these natural remedies for ADD/ADHD are great and offer good advice for all humans, specifically connecting with nature seems to offer additional benefits. The lower level of stress levels of children who live in areas where regular exposure to nature is possible is evidence of the restorative effects that nature can have on the human psyche (Louv, 2008).

Theoretical Lens and Related Theoretical Literature

Attention restoration theory. Stephen Kaplan (1995) was the first to discuss the restorative benefits of spending time in nature for people who are experiencing mental fatigue, also called

attention fatigue. Attention fatigue occurs when a person's attention is intentionally directed at one task or specific stimuli for extended periods of time, such as in a traditional classroom. This form of directed attention is involuntary and difficult to maintain. While it is central to focusing, it requires a concerted effort. When forced to focus on one thing, the mind must shut out all other stimuli competing for its interest by use of inhibitory mechanisms. The individual eventually finds it hard to concentrate and control impulses resulting in feelings of anxiety and distraction. Studies of college students have shown attention fatigue can possibly result in lower academic performance (Feltsen, 2008; Tennessen & Cimprich, 1995).

The symptoms of attention fatigue caused by directed attention mimic those of ADHD so closely that the ADHD evaluation template has been used to identify it. Kaplan believed there must be a common cause to both maladies, although unlike ADHD, attention fatigue is a short term condition. Believing that the underlying causes were similar, he undertook a study to find something to counteract attention fatigue, hoping to generalize his findings. With his study, he was able to show that individuals with attention fatigue enjoyed relief after a brief exposure to nature, such as a walk among trees in a park. He called this attention restorative therapy. It was his contention that the mind was fatigued by the directed attention and that nature provided relief because one's attention is engaged so effortlessly in nature. Casually observing the motion of waves or wind in leaves does not require specific attention, only quiet contemplation. This allows for the restorative effects on the brain.

Key factors in attention restoration theory. There are four factors that make up a restorative situation and allow the brain to recover from directed attention (Kaplan & Kaplan, 1989). The first is *being away*. This refers to getting away from whatever is causing the directed attention. There are three ways to do this and the actual restorative benefits are maximized by a combination of all three. One is simply removing one's self from unwanted, distracting surroundings. Next is to put psychological distance between one's self and regular routines. The third is to stop dwelling on any

one particular pursuit, at least temporarily. The psychological aspects of being away play as important a role in being away as the physical aspects. Just removing the physical distractions would not be enough. For example, a basement room with no windows might be less distracting than a crowded room, but it would probably be more boring than restorative. Most research in this area has focused on the physical aspect of being away in relationship to outdoor recreation (Hartig, Korpela, Evans, & Garling, 1997) and has not dealt with the mindfulness.

The second aspect important for restoring directed attention is *extent*. This refers to the extent to which the location (or mindfulness) that is implied in *being away* can satisfactorily provide restoration. It is concerned with the connectedness and the scope that the individual feels for the location. The connectedness in this case is an immediate relationship in the new surroundings. The scope is the domain, which can encompass both real and imagined surroundings (Hartig et al., 1997). This allows for the *being away* to be in an intellectual pursuit as well as a physical one. Looking at photographs of physical locations in which the individual is interested could constitute being away to a great extent, if the individual can picture his/herself there in his/her imagination.

A third aspect of restoration is fascination. *Fascination* is not completely straightforward in allowing for restoration from directed attention. Some *fascination* can be so intense that it requires more directed attention from the brain and so is counter-productive. This is the case with violence which negatively affects the brain. To address this, the Kaplans (1989) refer to soft fascination. Soft fascination concerns pleasant stimuli that do not require direct focus in order to be appreciated. It is in soft fascination that recovery from over stimulation of the prefrontal cortex takes place (Hartig et al., 1997). Before Kaplan's research (1995), recovery was thought to happen with rest only. Most attention was paid to not overloading the directed attention of individuals without considering a way to speed recovery. Natural settings are considered to be areas of soft fascination. Flowers, trees, and other aspects of nature allow for pleasant stimuli without directed attention.

The final aspect of restoring attention is *compatibility*. This refers to the individual's compatibility with the environment in which he/she is located. It has been postulated that stress is caused by a mismatch of the individual with his/her environment (Evans & Cohen, 1987).

An early study examined if a restoration effect would be observed if participants were shown pictures of nature (Ulrich, Simons, Losito, Fioriteo, Miles, & Zelsa, 1991). In this study, participants were shown slides of three different settings. One was a natural setting with water as a major element. The second was a natural setting with vegetation and no water. The third was a man-made setting with no water or vegetation. After viewing each slide the researchers performed a series of non-invasive physiological tests, for example measuring blood pressure, to determine their reactions. They also completed a self-evaluation. The results clearly showed a significant restoration effect after viewing the natural settings compared with the man-made, urban settings. In addition, the slides showing water showed the greatest effect of all.

In a study done to measure the restorative quality of different environments, researchers (Hartig et al., 1997) developed the Perceived Restorative Scale (PRS). They developed the scale as a measurement tool so that they could represent the four above mentioned factors that are necessary for a restorative environment; being away, extent, fascination, and compatibility. A second reason for developing the scale was to distinguish between the different environments in respect to their potential for restoring attention. The researchers used four different techniques as validation strategies in developing their scale. The study was conducted four different times, twice with American subjects, once with Swedish subjects, and once with Finnish subjects. Eight different sites were chosen based on outdoor vs. indoor location, and natural vs. man-made. These were all to be rated for perceived ability to restore attention. The researchers based these choices on two theories. One theory that they considered is that since humans evolved in a natural world, they would naturally be more able to adapt and be restored by a natural environment instead of a man-made one. The second theory that was used,

is that since the outdoors is generally larger and contains more things to look at than most indoor locations, the outdoor location would be more conducive to restoration. The locations were also in a range of low to high level of interest, such as the difference between a concrete parking garage (low interest, outdoors, man-made) and a rock garden in a park (high interest, outdoors, natural). The results indicated that the perceived restoration scale is adequate, but that the four factors of being away, extent, fascination, and compatibility need to be considered independently even though they are often described as building on each other to increase restoration (Hartig et al., 1997).

Neuroscience of ADD/ADHD. Neuroscience backs up Kaplan's (1995) contention that the similar symptoms of directed attention fatigue and ADD/ADHD are caused by a similar underlying mechanism. In that same year, a study (Molle et al., 1995) was done that showed that the right prefrontal cortex of people with attention fatigue is what tires and so causes symptoms of attention deficit and impulsivity. This occurs in the average individual when attention is directed at a single focus, such as a reading a book or listening to a lecture. While the individual is focusing on his/her attention on the task, his/her brain is forced to shut out other stimuli competing for attention. If this directed attention goes on for too long, the individual becomes fatigued and symptoms such as a lack of focus and an increase in impulsiveness and anxious behavior can result. It is the right prefrontal cortex specifically that tires and causes these symptoms. As mentioned earlier, in a study of children who have been diagnosed with ADD/ADHD, the right prefrontal cortex was often physically smaller than in children of similar age (Molle et al., 1995). In fact, the more profoundly the ADD/ADHD symptoms are expressed, the more asymmetry is found between the left and right lobes. While there is a distinctive neural activation pattern, the more striking difference in the ADD/ADHD brain maybe the smaller volume of gray matter overall, especially in the right prefrontal cortex (Barkley, 2015).

Others have found differences in the dimensions of the frontal lobes of the ADD/ADHD brain. Trip and Wickens (2009) found an overall reduction in brain size and dimension, resulting in a

preference for immediate over delayed gratification and the display of a high degree of impulsivity.

To further back up the relationship between the right prefrontal cortex and the symptoms of ADD/ADHD is a study done on individuals with aphasia (Glosser & Goodglass, 1989). Aphasia is a communication disorder often caused by brain trauma from injury or illness, such as a stroke. Aphasia creates a difficulty in using words and understanding them. Aphasic patients with lesions found on the right prefrontal cortex, showed greater impairments than others on visual and spatial tasks. Since individuals with aphasia often present with symptoms similar to those of ADD and the same area of the brain is involved, a correlation might exist (Murray, 1999). In healthy brains, reducing the fatigue in the prefrontal cortex should lead to a lessening of symptoms, referred to by Stephen Kaplan as Attention Restorative Therapy (Kaplan, 1995).

Specific Literature Related to the Current Study

Introduced in 1995 by Kaplan, attention restorative therapy was further studied by Francis Kuo and Andrea Fabor Taylor (2001, 2004, 2009). Kuo and Taylor were pioneers in their studies, attempting to determine whether brief exposure to nature could have a positive effect on reducing symptoms of ADHD. They did several studies that showed that contact with everyday nature had a definite effect on the ability to focus and perform tasks that required attention. They did their studies, which will be detailed later in this section, with children who had been diagnosed with ADHD. In an unpublished field study, the method involved a parent questionnaire detailing the child's behavior and ability to focus after either a 20 minute walk in an inside area, a calm activity, or a walk outside. The parent did not know which activity the child had engaged in when answering the questionnaire. The activities were randomized and repeated. The studies were done across different socioeconomic groups and four different geographical regions. In all cases, the students who had been exposed to nature by taking a walk outside were calmer and better able to focus and control their impulsive tendencies. The effects were so pronounced that they mimicked the effects of current medications.

There have been many studies that connect humans with the benefits of interaction with nature (Kaplan, 1984; Hartig, Mang, & Evans, 1991; Cimprich, 1990; Canin, 1991; Gilker, C, 1992; Lohr, Pearson-Mims, & Goodwin, 1996; MacDonald, 1994; Ovitt, 1996; Ulrich, Simons, Losito, Fioriteo, Miles, & Zelson, 1991). Even though these studies were done using many different methods, they all showed a connection between attention functionality and nature. Given the varied nature of these studies, a result that was able to be shown across all of them should be assumed to have merit. They showed a positive benefit regardless of the how nature was defined in the study. The different studies explored outdoor wilderness areas, parks, and even house plants as well as photographs of natural objects.

A negative finding was the result in only one case (Larsen, Adams, Deal, Kweon, & Tyler, 1998). In this case, the researchers were looking only at productivity of workers with three different density levels of houseplants in the office. They found that the workers actually scored a little worse on a test of how many letters they misrepresented on a one minute test in the setting with the highest density of plants. In discussing their results, however, the researchers stated that the “participants recorded the highest degree of comfort, attractiveness, and performance assessment in the office with the highest level of plants” (Larsen et al., 1998, p77). This would indicate a possible positive result if emotions had been considered in the original hypothesis.

The studies of Kuo and Taylor are referenced by most researchers in this area and so more details of each of their early ground breaking studies are presented here. The first study that was undertaken by these two researchers was done in association with two other researchers (Taylor, Wiley, Kuo, & Sullivan, 1998). They wanted to know if growing up in the inner city without a great deal of vegetation would have an effect on the play behavior of the children. The researchers used resident collaborators to help collect data in the form of observations. Observers watched particular spaces that had been designated as either high vegetation (mostly in the form of trees) or low vegetation. They

observed not only whether children played, but also how they played. The spaces were observed both during after school hours and on Saturday afternoons. They found that the level of play was significantly more creative in the areas that had more vegetation. Since creative play is necessary for enhancing the imagination of the adult (Cobb, 1993), without early childhood experiences with nature, there is likely to be a reduction in the imagination of the next generation, at least for the specific population of inner city, lower socioeconomic children.

The next major study that these researchers took on started to make a connection between play in green settings and a way of coping with attention deficit disorder (Taylor, Kuo, & Sullivan, 2001). They knew that studies had positively connected attention restoration in adults with exposure to nature (Ulrich, 1981; Hartig, Mang, & Evans, 1991; Kaplan, 1995) and they wanted to determine if this would generalize to children. The first part of their two part hypothesis was that the symptoms of childhood attention deficit disorder would be more manageable after leisure activities that took place in a green setting than after leisure activities in another setting. The second part of the hypothesis was that the greener the everyday environment of a child is, the more manageable, in general, his/her ADD symptoms would be.

Their (Taylor et al., 2001) research method was to use a survey. The survey questionnaire and research methodology were developed by extensive interviews with parents of children with ADD/ADHD, medical and educational professionals, and with the children themselves. The researcher tried to produce a questionnaire for the children themselves, but found that the children were unreliable at reporting the after effects of leisure activities on their own ADD/ADHD symptoms. Parents were better able to reliably report these effects. The questionnaires took the form of a small booklet that could be completed in about a half hour. It included open-ended questions that asked parents for one or two leisure activities that their child had participated in that made his/her symptoms better and also one or two that made the symptoms worse. Since the connection that has been established is for attention

deficit and nature, and not for hyperactivity (Kaplan, 1995), the researchers focused on this aspect of the disorder. Parents were able to offer at least one example of what made symptoms better and one that made symptoms worse in 66% and 68% of the time, respectively. Researchers then coded the answers as green (natural setting), not green (unlikely to take place in a natural setting), and ambiguous.

In the next section, parents were asked to rate the after effects of a list of typical after school activities using a Lickert Scale. To help control for unrelated influences, these lists were to be rated twice, once when the child participated alone or with one other person, and again for activities that the child engaged in with two or more other people.

The last section of the questionnaire required the parents to rate the severity of their child's disorder and also the relative greenness of their residence and general surroundings. A Lickert Scale was used for this activity as well.

The makeup of the participants mimicked the preponderance of ADD in the general population with a ratio of boys to girls as 3:1, and the children were between seven and twelve years old. They were recruited through advertisement and offered a small incentive to participate. Due to the recommendation of medical and educational professionals, the study took place at the end of September through the middle of October. The reasoning was that the school year was well underway, so students would be more settled, but the weather had not turned significantly colder which might affect outdoor activities.

Using a Chi Square, it was determined that a statistically significant number of green activities were rated as best for increasing attention functionality and those considered to not be green activities were rated as the worst. The researchers were able to rule out the chance that parents had guessed the reason for the choices and by doing so skew the results by doing post survey interviews. Similar results were found for the second and final sections of the questionnaire and further validated by

individual follow up interviews with the parents.

The original hypothesis, that nature in the form of activities in outdoor green spaces can help with the attentional functioning of children with a diagnosis of ADD, has been upheld by the results of the survey. The second hypothesis of lessening the severity of symptoms also is upheld.

The researchers offered six possible explanations for the results based on the idea that, while a relationship has been established between nature and attentional functioning (Kaplan, 1995), a third factor related to both could be involved. Factors such as being outdoors vs being green, or the social context of activities performed alone or in groups, were thoroughly explored and each explained.

The findings in the study are correlational in nature. The researchers, however, explain that the results can be interpreted in a causal manner since the way that the data was collected was to inquire about the after effects of activities in green vs. not green settings. Therefore, a causal relationship could be inferred.

There are some issues when considering whether to generalize the findings from this study. For example, the study took place in the Midwestern region of the United States during the early fall. In this area, the natural outdoor settings usually include trees and grass. Would the findings be the same for an arid or swampy region? Would the findings be the same in winter without leaves on the trees? Would the findings be the same during the summer without the attentional requirements of school?

The study participants were predominantly middle class and all had been characterized as being severely affected by symptoms of ADD/ADHD. There is no evidence to show whether these findings can be generalized outside of this population group.

This study adds to the growing body of knowledge concerning attention restoration therapy. Although previous studies (Kaplan & Kaplan, 1989; Kaplan, 1995; Hartig et al., 1997) showed a relationship between nature and attentional functioning in humans, this study shows evidence that children may be affected as well. This study also introduces the additional concerns of children with

ADD/ADHD as possible benefactors of the knowledge gained.

In the same year, Francis Kuo (2001) published another study that further added to the knowledge by examining a different population subgroup. She wanted to determine if even a small amount of green space in a socio-economically disadvantaged inner city area could help increase the ability of residents to cope with poverty. She used structural interviews and self-reports to determine the effect, if any. Attentional capacity was measured using the Digit Span Backward test which tests for attention fatigue (Cimprech, 1990). Residents near green spaces showed a significantly higher ability to manage the life stress associated with coping with poverty than those in less green areas.

Francis and Kuo completed another study in 2004 that was not published. For this study they used the same sample population that they used in their seminal 2001 study of the connection between ADD and nature. Once again all of the participants were middle class Midwestern children all of whom had been diagnosed with ADD/ADHD. The methods of this study, however, were very different. They took students on guided walks in three different settings. The settings were indoors, outdoors but not in a green area, and outdoors with natural vegetation and green spaces. Following the walk, each child was tested by a single evaluator who administered objective measures of attention deficit. The children performed significantly better after walking in the greenest area than in either of the other two settings. The fact that the same children were tested after each of the three settings removed the variable of different children having a different response because of personal preference. Once again, however, the study was done in the same geographic region which did not answer the questions raised by their first study.

A third study by Taylor and Kuo addressed some of the concerns of their previous studies by making it a national study (2004). The study resembled the published 2001 study in methodology. The researchers used the same survey method, but this time the ages of the children ranged from five to eighteen. There were 406 responses (84 girls, 322 boys) included in the analysis, including six from

the Spanish language version. The results were very similar to their earlier study but this time it covered many more geographical regions. This answers the question whether only Midwestern style green spaces had a positive effect. Also, since the participants were from many different socio-economic groups, wealth can be removed as a variable.

The researchers discovered that children with attention deficit disorder without the hyperactivity component received the same positive attention functioning results, suggesting that the activity was not just using up excess hyperactive energy. Low energy activities that took place in green spaces also showed a positive result further backing that idea. They concluded that the effects were so dramatic that they could perhaps ameliorate the use of medications in many children with ADD/ADHD.

It should be noted at this point that in a letter to the editor in the *American Journal of Public Health* in March of 2005, two psychiatrists (W. Canu & M. Gorden), complained that the study was questionable due to the fact that the researchers did not use a healthy control group for comparison and also that parents can be unreliable judges of their own children. The researchers responded that they had acknowledged the questionable reliability of parental reporting and concurred that more studies were needed, including those with larger participant groups.

A study done a few years later looked into whether attention restoration therapy could have a positive effect on college students (Felsten, 2008). The researcher postulated that since college students spend so much time focusing in lecture style classes that they might be particularly sensitive to attention fatigue. Colleges that provide areas for restoration of attention might help raise student performance by reducing this fatigue. The participants took part in an online study that showed them pictures of different college break areas in order to rate their perceptions of the restorative ability of each area. The areas were either areas with no windows, areas with large windows with scenes of man-made structures, or areas with large photographic murals. The wall sized murals were either of landscapes or contained water features. As the researcher hypothesized, the students overwhelmingly

preferred the areas with life sized murals of nature. This study added to previous knowledge by proving that not only can photographs of nature have a restorative effect, but that the type of nature photograph makes a difference.

In 2009, researchers Kuo and Taylor published yet another study. This one was similar to the field test that they did, but did not publish, in 2004. This study was designed to explore what effect different after school activities might have on the severity of ADD/ADHD symptoms. The participants were 17 children (15 boys, 2 girls) all professionally diagnosed with ADD/ADHD. The study consisted of each of the children being taken for a 20 minute walk in three different settings on three different days. The settings included a park with a great deal of natural vegetation, a neighborhood with much less vegetation, and a downtown area with no vegetation. The walks were done in different order so that familiarity of the activity would not influence the results. They were done at the same time of day, the same day of the week, during the months of June and July between the hours of 8:30 am and 5:00 pm. The participants were not medicated before, during, or immediately after, the walks. Before the children went on their walks, they did several puzzles that were designed to induce attention fatigue. They were then driven to the location of that walk, with one adult observer/guide on an approximately three minute drive. The guides were discouraged from holding conversations with the participants. The children were asked to rate their experience following each walk. After the walks, the participants took several tests designed to measure concentration and impulse control.

One of the tests that the participants used was Digit Spin Backwards (DSB). This test requires that the participants listen to a list of two to eight digits and then repeat them back in reverse order. If they get the order correct, a new stream of numbers is given with an additional digit added to it. The score is determined by the highest number of digits reversed correctly. This standardized test is recommended to help diagnose ADD/ADHD because it shows deficits in attention (Hale, Hoepfner, & Fiorello, 2002).

The results showed no significant difference in attentional functioning after the walks in the neighborhood or the downtown area. However, a very significant increase in the children's attentional functioning was found after the walk in the park. The results were so significant that they mimicked the results of some medications. There is no evidence about how long these effects last. In their two previous large scale survey studies (Kuo & Taylor, 2001 & 2004), the researchers note that the effects last at least long enough for the parents to notice.

Similar results were found by Paul Fox and Elias Avramidis (2003) in the United Kingdom. Their work dealt with 9 and 10 year old children who were so severely affected by emotional and behavioral issues that they were in residential institutions. For these children, ADHD was only part of their diagnosis. These children were systematically exposed to nature and their reactions and behavior were observed by the researchers. Their academic progress and behavior after their time in nature was tracked by the staff and by the children themselves. They all showed a marked improvement in both academic and social areas. While the researchers were quick to point out that this was not a solution to all of the problems facing these children, it could be a tool used by caregivers to help reduce their suffering.

Yet another study, this time in the Netherlands, seems to corroborate the findings that children with ADHD do better after spending time in nature (A. van den Berg & C. van den Berg, 2011). The study focused on two groups of six children each, ages nine to seventeen, who were staying at Care Farms for children with ADHD. The field study was conducted over three days. On the first day, the observers started by meeting with the students and having them do a group activity with a physically interactive video game at each of the farms. On the next day, they were taken to the woods to build a cabin as a group activity and on the third day to a town with specific instructions on how to spend their time. All of the activities were designed to be similar in physical activity level. The study was designed for the students to be accompanied by one observer and one member of the farm staff.

During the activities the researchers observed the students using a checklist and recorded activity based on the six behavioral criteria: social, cooperative, enthusiastic, aggressive (verbal and physical), inattentive, and impulsivity/hyperactivity. After each activity, the researchers performed a group interview and then met with the students individually in order to measure their cognitive functioning. Since most of the students had short attention spans and issues with reading, all questions were read aloud.

For the group interview, the students were given cards that indicated three levels of agreement with the questions and were asked to hold the appropriate sign based on their response to questions (no, a little, or yes). The students were then asked ten close-ended questions that were based on the Connected to Nature Scale (Mayer & Frank, 2004), and the Perceived Restoration (Hartiz, 1997). They used Cronbach's Alpha to rate the reliability of the sub-scales of general environmental evaluation and perceived restoration. The researchers then used a mood test that they had previously developed for other studies (van den Berg, 2007). This scale involved six pairs of smiley faces in sets such as happy-sad and tired-energetic. The students answered questions about their mood by rating it at any of seven circles that ranged from one word in the set to the other (similar to a Lickert Scale). The final test was for concentration and attention. For this they used the Opposite World's Test (TEA-Ch: Manly, 1999). In this test, the students are asked to observe a printed winding path with the digits 1 and 2 listed in various order. The first time, they are to read them as they are printed. The second time through, they are to do the opposite and read 1 every time they see a 2 and vice versa as quickly as possible. The difference in time between the two responses is taken as the dependent variable.

After analyzing the data, the researchers concluded that spending time in the woods had an overall calming effect on the students as opposed to spending time in the man-made settings of the village and the farm. They stated that the study was a small one, but indicates a possible connection between spending time in nature and a positive behavioral effect.

While the study was intriguing and did explore the hyperactivity component, the study was very small. It also did not address the fact that the study took place over three days only. A major problem with this is that the children answered questions on successive days, first at the farm, then in the woods and finally, on the third day, the town. It is possible that by the third day the children would no longer see the situation as novel and this might influence their answers.

Others have noted the restorative effect that contact with nature can have on children with ADD/ADHD. When ADD children were tasked with the direct care of animals, Peter Kahn and Stephen Keller (2008) found that through interaction with the animals, the children demonstrated increased attention, decreased hostility and aggressiveness, and an increase in cognitive behavior.

A study in Florence was designed to study what, if any, the effects of exposure to green vegetation would have on the ability of primary school students to direct their attention to simple tests (Mancuso, Rizzitelli, & Azzavello, 2006). The students' capacity for directed attention would be defined as their ability to block out distractions. The test involved 80 students age eight to ten with similar education and intellectual abilities. They would be solving the Trail Making Test (TMT) which was created by Partington and Leiter (1949). The test involves changing numerical stimuli to alphabetic and measures skill in visual and spatial stimuli. The test has two parts. The first is to use a pen to connect numbers which have been randomized over a paper in proper order from 1 to 25 as fast as possible. On the second part of the test, the numbers 1 to 19 are written, as are the letters A to L, once again randomized over the paper. The student is required to draw a line connecting the number to the corresponding letter as fast as possible. The TMT can usually be completed in 5 to 10 minutes and is designed to evaluate several processes. It can evaluate spatial organization, writing speed, recognition of letters and numbers as well as their proper sequence, and problem solving abilities, among other things. It is not difficult or overly frustrating to the students which is an important consideration when working with children.

The students were divided into two groups of 40 each. One group consisted of eight year old children and the other group consisted of ten year olds. The younger children were only given the first part of the test (number sequencing) while the older group did both sections. Half of each group (20 students) took the Trail Making Test individually with a teacher and an observer in a linguistic laboratory without vegetation or access to a window. The other half took the TMT in a garden. The observer timed each test, starting the clock when the child started the test and stopping it when he/she finished correctly. If a child made a mistake, the observer corrected him/her while letting the clock run until completion. The results showed a significant decrease in the time it took for all groups to complete the test. Even though the indoor environment of the laboratory was very quiet when compared to the outdoor garden with many distractions and noise, the students performed better outside, sitting under the trees.

Both anecdotal and scientific data point to the idea that being in green spaces, even small urban gardens or somewhere with a view of trees through a window, has a positive effect on people, especially children, whether they suffer from ADHD or not. Physical exercise has long been considered to be one of the more effective treatments for ADHD (Robelia, 1997). Since medications for the disease often are expensive and can have profound side effects, cutting down on the use of them (if not cutting them out entirely for some people) would be a positive change. Stephanie Watson wrote that green space therapy or green time used effectively could drastically reduce the need for such stimulants as Adderall, Concerta, and Focalin (Watson, n.d.). The authors who write about green time, often refer to their discipline as eco-psychology (Roszak, 1992; Reser, 1995; Hoelterhoff, 2010).

Literature Related to the Topic

Eco-psychology. Eco-psychology is a word that refers to a school of thought that shares traits from ecology and psychology (Roszak, 1992). A discussion is presented here since there is a risk that the idea of having children who have been diagnosed with ADD/ADHD spend time in nature, as

opposed to a more pharmacological approach, might be seen as soft and lacking scientific inquiry. The idea of helping to heal the mind through a reconnection with nature could be considered at the center of this new discipline.

In a conference on this new pseudo-science, a paper was presented that argued that it was important for eco-psychology to save itself from itself by means of accepting the need for scientific inquiry (Hoelterhoff, 2010). Often eco-psychology has been accused of being more religious and mystical than actual science. For some, this is not a negative, as it serves to perhaps relate the traditions of other cultures and better understand (the) natural place of human(s) in the world. In his book *The Voice of the Earth: An Exploration of Eco-psychology*, Theodore Roszak (1992) attempts to explain this relationship. He discusses the psychological processes that have to occur for modern humans to ignore the effects of removing themselves from nature and not making a real attempt to stem the tide of environmental issues that could eventually result in making their own world unlivable.

Eco-psychology may be better served by aligning itself with experimental scientific procedures rather than drifting toward a more inspirational mystical approach. Research based, scientific inquiry is more acceptable if the end result is to be taken seriously by the medical and scientific communities. (It also provides an objective framework for evaluation of the efficacy of the treatment)

The science of Psychology has been accused of lacking depth. Even though psychology deals directly with human behavior, many studies have neglected to include a humanistic approach. Eco-psychology does not define specifically what is meant by the psychology within its context (Reser, 1995). Other semantics issues include the fact that in environmental psychology, the word environment does not mean outdoors, but simply the surroundings. In examining the relationship with the outdoor environment, the word ecology has been substituted.

Deep ecology is a more mystic term, referring to a spiritual relationship with nature. Nature therapy may be the next step.

Nature therapy. In a nature therapy program in Israel, therapists use nature and art to attempt to reconnect people with ecology and community. The participants have been diagnosed with anxiety, depression, and trauma. Just like in people with ADD/ADHD, the right side of the brain had been connected to these types of social/psychological issues (Ross, 2008). The right side of the brain also houses spatial awareness and other artistic abilities (Edwards, 2010). Nature therapy brings all of this together and uses art to stimulate the right side of the brain while simultaneously using nature to allow the right side of the brain to rest (Brogen & Tiry, 2012). This is a non-verbal, non-cognitive approach. They have also included several elements from different psychological and social therapy programs. The theoretical framework within which they are operating is the exploration of the connection between the separation and detachment from nature, community, and religion, and a more secular, capitalist life. The pretext is that this detachment damages well-being and involves a great deal of simple ritual.

Eco-art therapy is an approach that includes nature therapy, right brained art education, and a deep appreciation for nature that sounds almost mystical. In a book with detailed lesson plans, the late Theresa Sweeney Ph.D. (2013) discusses a holistic approach to reconnecting with nature. She encouraged patients in her psychiatric practice to immerse themselves in the natural environment as one would immerse one's self in a foreign culture (personal communication 12/2014). She identified 54 "natural web-string senses and sensitivities". These senses include radiation, mental, feeling, and chemical abilities of humans to connect with nature in ways that modern people have forgotten.

Nature therapy is an experiential approach that takes the therapist and the patient out of the therapist's inside space and out into the natural environment which belongs to everyone, or no one (Berger & McLoed, 2006). People share nature, not only with each other, but with all other animals and plants. This could be generalized to taking students out of the classroom. Once they are out in nature, the teacher, while still in control, becomes more equal and hopefully more accessible to the

student. While nature therapy is related to the topic of reconnecting ADD children with the out of doors, it is confined to the realm of psychologists. Outdoor education for a broader audience takes a different approach.

Outdoor education. Although not necessarily in response to the findings of the benefits of spending time in nature, outdoor education experience groups have been developing over the last several decades. In the 1960s and 1970s, as more people began looking to reconnect with nature, programs such as Outward Bound answered a need for adventure in the out of doors. These programs proliferated and began to offer many choices including backpacking, sailing, rock climbing, and many other pursuits. While not designed for treating behavior issues, anecdotal evidence pointed to the fact that participants were calmer and felt definite restorative effects from their outdoors experience. Boot camps evolved to include programs attempting to help troubled youth and, once again, anecdotal evidence of effectiveness is all that was available. After several boot camp deaths over several years were reported in the press, questions arose as to their safety. In 2008, researchers undertook a follow-up survey to determine the oversight of Outdoor Behavioral Healthcare Programs or OBH in the United States and Canada (Russell, Gillis, & Lewis, 2008). They found that, as compared to 2001, the number of clinical treatment facilities increased while the amount of family involvement in those facilities decreased. They also found that the majority of the facilities were licensed while only about half were accredited. In a more recent study of this treatment modality, it was found that many facilities have gone out of business due to legal and insurance reasons while those that remain have become more sophisticated in their clinical offerings (Hoag, Massey, & Roberts, 2014). There seems now to be a body of work that agrees that outdoor education works to help all participants feel more energized and focused (Baldwin, Persing, & Magnuson, 2004).

A recent study (Mackenzie, Son, & Hollenhorst, 2014) finds that most experiential education is not based on empirical science. The author suggests that there should be more integration with the

field of psychology. This would allow researchers and practitioners to explain and implement their programs better and would also more closely link the practice with the research. Empirical evidence would allow for a real comparison of programs and their efficacy. Complementary fields such as physical and mental health issues, environmental concerns and even academic achievement gaps would be better addressed if linked by actual empirical scientific data.

Outdoor time during the school day. As early as 1991 (Ulrich et al.), studies have shown that for people looking at pictures of nature, especially pictures of water, a restoration benefit can take place. Schools should take notice. There are many ways that the school environment could be improved. School buildings could have big windows with views to nature. The classrooms could be filled with plants, terrariums, and especially aquariums. Large, poster sized photographs of natural location could be wherever windows are not feasible. Unfortunately, recent security concerns about safety in schools place windows high on the walls which make it hard for students to look outside. With teacher evaluations and pay now often tied to more rigorous academic standards, more time is spent in instruction and less time on recess. It should be noted that researchers have cited the viewing of nature as restorative, which allows for more attention functionality which should generalize to more learning since attention is necessary for learning to take place (Duncan et al., 2007).

Herbert Broda has written several books on enhancing outside learning including *Moving the Classroom Outdoors* (2011) and *Schoolyard Enhanced Learning* (2007). One way to increase the time that children with ADHD spend outside is to encourage elementary and middle school teachers to take their entire classes outside on a regular basis. He argues that there is no reason to restrict learning to the four walls of a classroom. Outdoor education can include many things. It can be just teaching regular classes outside or it could include environmental education or a combination of both. *The Nature Connection* by Clare Walker Leslie (2010) offers lessons to be used outside that focus mostly on science.

There are many reasons to include outside time in the schedule of every child, every day. The connection between an increase of attentional functioning and a reduction in ADD/ADHD symptoms has been established. Time spent in green spaces has a restorative effect on adults and children. Having children spend time outside during the school day, either in class or during a break, could improve their overall performance.

Going outside is free and it has no negative side effects. In fact, the side effects associated with adding more nature and unstructured outdoor time might be a reduction in obesity, diabetes, and other physical maladies that have only recently become a major concern in children. Other mental, emotional, and behavioral issues might also be addressed.

Unresolved issues in literature addressed by proposed study. There has been much written about a link between the health of the human population and its connectedness with nature. It seems with every generation, people in the most technologically advanced countries, along with those in countries that aspire to become more advanced, become less and less connected to the natural world. Anecdotal reports from people of every generation bemoan the lack of unstructured outdoor play in the lives of subsequent generations (Kartzen, 2005). Children play more inside using electronic media. Even when they are outside, they are often engaged in specific sports with rules and regulations and not able to enjoy their surroundings. There is a great deal of concern that this change in outdoor play has resulted in a disconnection with nature (Louv, 2008). Could this disconnection lead to an increase in attention fatigue? Does this increase in attention fatigue lead to an increase in the diagnosis of ADD/ADHD? If so, could reconnecting with nature reverse this trend? Nature has a restorative benefit for the human brain. The trend away from the natural restoration of the brain could have negative consequences for the human population.

A case study would be a good way to evaluate what the current situation is in regards to this trend. Examining very closely how one small group responds to a short walk in nature could fill in

many of the spaces left by prior studies. One field study that was referred to in this chapter, took a look at one of the effects that a similar walk had on children with ADD (Kuo & Taylor, 2009), but they did not look in depth into any of the participants and the overall effect of time in nature on the individuals. They could not answer, for example, how long the effects would last and if they made any difference in the life and academic functioning of the participants. In a case study several effects could be examined including ones that have not yet been hypothesized. A case study allows for new hypotheses to be explored as they are introduced into the study due to its qualitative nature.

Another element that seems to be missing from most previous studies is the effect of nature on children with ADD with the hyperactivity component, sometimes called the combined type. That component would be addressed in a case study with multiple participants in which several have been diagnosed with ADD/ADHD. Hyperactivity and impulse control may be connected with attention fatigue and could also be affected by attention restoration therapy.

Summary

To summarize this chapter, attention fatigue happens when voluntary attention is directed at a particular stimulus for an extended period of time. This fatigue is particularly evident in the prefrontal cortex of the brain. Symptoms of this fatigue are impulsivity, lack of focus, and an inability to concentrate leading to misbehavior. These symptoms are similar to those of Attention Deficit/Hyperactivity Disorder. Children with ADD/ADHD have been shown to have a smaller prefrontal cortex than average children of similar age. This implies that similar restorative effects may take place within the two populations (adults with attention fatigue and children with ADD/ADHD) when attempting to reduce symptoms of attention fatigue. Many studies have been cited showing a connection between exposure to nature and restoration of attentional functioning (Kaplan, 1984; Hartig, Mang, & Evans, 1991; Cimprich, 1990; Canin, 1991; Gilker, C, 1992; Lohr, Pearson-Mims, & Goodwin, 1996; MacDonald, 1994; Ovitt, 1996; Ulrich, Simons, Losito, Fioriteo, Miles, & Zelson,

1991). Other studies have shown the same effect on children with ADD/ADHD. A case study of taking several children with ADD/ADHD on a short (20 minute) walk in green spaces before their regular academic testing (such as weekly spelling tests and math quizzes) is a method that had not yet been tried. A combination of observation, testing, and interviews of stakeholders should add to the accumulated data about the topic, as well as to fill in some of the spaces that currently exist in the field. The literature concerning the connection between the restorative benefits of nature on the brains, and subsequently the lives, of children with ADD/ADHD has been presented in this chapter. It shows that further evidence would be helpful in order to provide clear empirical data for this connection. It is within the scope of this case study to provide some data to this end.

CHAPTER 3: Research Methodology

Description of Qualitative Research

Qualitative research does not require the researcher to approach the study with a specific hypothesis, but allows the researcher flexibility in developing a focus (Bogdan & Biklen, 1982). In this case study, the researcher had a flexible initial focus that was further developed as the study unfolded. The focus is that if students with attention issues are given a brief (20 minute) walk outside might they be better able to focus in the classroom? Might they be better able to concentrate on lessons? Could this lead to better performance on later tests? What other behavioral changes might the students exhibit? The researcher, as observer, conducted the walks and kept a detailed journal on the behavior of the participants. The researcher followed the walks with semi-structured interviews of both the students and relevant adults. Additional data was collected such as an examination of the classroom test scores, observations of students, and a closing survey.

Qualitative research requires the researcher to make a real effort to connect with the participants and to understand their point of view. Empathy and developing a deep understanding of at least a part of the lives of the participants is crucial to the success of the case study (Bogdan & Biklen, 1982). The researcher was able to connect with the participants on the walks as well as to observe them on days when walks are not scheduled. This enabled the researcher to develop a clearer picture of the positive effects that might be gained with the nature exposure.

The question of generalizability is one that is often broached in discussing qualitative research data. In this case, the idea of generalizability is not a major concern of the researcher. Its importance will be specific to each individual reader of the study. There may be some commonalities between the participants and students in the general population, but this case is only concerned with the effects that brief exposure to nature causes the participants and to provide thick, rich descriptions of those effects. This approach would allow for others to make comparisons between their own contexts and determine

if any findings might be applicable (Ary, Jacobs, & Sorensen, 2006).

Description of Case Study

Case studies are detailed examinations of one setting or one group of individuals (Bogdan & Biklen, 1982). This case study looked closely at a group of sixth grade students, many of whom have been diagnosed with ADD/ADHD. Their own personalities and unique temperaments unfolded to the researcher as the study continued. Introducing the participants to a brief exposure to nature during one specific class time was postulated to make a difference in these temperaments, at least temporarily. Close observation revealed this. In a journal, the researcher carefully noted and described any responses, verbal or otherwise, that participants exhibited when exposed to the nature setting. This revealed subtle differences in behavior.

Case studies give in-depth descriptions describing the particular setting and people involved in the study (Ary et al., 2006). Case studies are not necessarily purely qualitative, but can contain quantitative components as well (Yin, 2003). Along with semi-structured interviews of the participants and the teacher, the researcher examined test grades of the participants for comparison and other relevant data was examined as the study unfolded. A follow-up survey was given to the students and the teacher at the conclusion of the data collection phase of the study to determine their overall impression of the benefits, if any, of a brief walk in nature during the school day. The results of the study was offered to the teacher, the students, and their parents for examination both during the study and upon its completion in order to verify all information. This last step was important to ensure that the researcher did not misinterpret observations.

A case study is used when the researcher is interested in investigating a problem within a real life context. When studying a contemporary issue in which the phenomenon and its context are closely interwoven, a case study is an appropriate methodology (Yin, 2003). The question of whether brief exposure to nature during the school day would have a positive effect on the behavior of middle school

students, particularly those previously diagnosed with ADD/ADHD, is such an issue. This question has been posited in quantitative studies by some researchers in the past (Kuo & Taylor, 2001; Kuo & Taylor, 2004; van den Berg, 2007; Mancuso, Rizzitelli, & Azzarello, 2006). A case study done on four to five students will add an additional aspect to the validity of these studies.

In this case study, participants were closely observed and behaviors were recorded over several different settings. Other case studies have been done with ADD/ADHD students as the participants (Hartlep, 2009; Stephenson, 2006) but were never published. To the best knowledge of the researcher, no formal research case studies have been done that involved a small group of children diagnosed with ADD/ADHD that looked specifically at the after effects of a brief exposure to nature. This type of case study could be described as heuristic since it is focused on providing new insights within a specific population (Ary et al., 2006). This study could also be described as an instrumental case study since this group can possibly represent other students in similar situations, although that would be determined by the reader and not the researcher.

This specific unit of sixth grade students with ADD/ADHD has been selected because it exists within the boundaries defined by the disorder. The participants all have issues with attention functionality. They all have to learn to function appropriately within the context of a public middle school. The researcher used observations to determine if this bounded group would possibly exhibit obvious behavior changes during and after a brief walk in nature. Unlike other research methodologies in which researchers examine a single behavior, the case study examines a range of behaviors and how these behaviors relate to the participant's life in his/her environment. The study took place over six weeks which allowed the researcher to observe the participants under different conditions and achieve a deeper understanding of how they respond to diverse environments within and around the school setting.

While this study has depth, as with most case studies, it does not necessarily have breadth. The

reader will determine how the information fits into similar situations and how it applies to him or her.

Participants

This case study focused on a group of students that is defined by the boundaries of being in a sixth grade intervention/enrichment class as well as having a diagnosis of ADD or ADHD. The case study focused on one class period and so the boundaries of the group are further defined. The class contains eight students, three of whom are male, most of whom have been diagnosed with ADD/ADHD. From within this group, purposive sampling of four to five representative individuals were selected to participate in the study. Purposive samples provided the highest level of understanding and insight into the case study of a small group of middle school students with focus issues. The group is small due to the depth of information that will be examined.

Before the case study took place, a pilot study was used to determine if the questions in the semi-structured interview are appropriate and understandable. A pilot study also helped to determine if the logistics of taking a group of students on a walk during the school day were completely worked out. According to Yin (2003), it is acceptable to use both convenience sampling and a larger number of participants for a pilot study before undertaking the actual case study. The researcher employed a pilot study that uses all of the students in a regular education visual arts class that meets at the same time as the proposed case study class. The students were taken outside for twenty minutes and then asked to write the answers to the questions that would be used on the semi-structured interviews. There were no names on the interview sheets. While the researcher observed the students during the pilot study, no notes were taken on specific behaviors. Only general observations based on the perceptions of the researcher were recorded and only for purposes of improving the case study.

Setting

The setting from which the researcher selected possible participants for this case study is a 6th grade study intervention/enrichment classroom in a middle school. The school serves grades six

through eight. It is located in a rural, agrarian county in East Tennessee. The majority of the students are Caucasian. School wide, 54% of the students qualify for the free or reduced lunch program.

The study involved short walks that were taken both inside and outside. Walks taken in a natural setting took place along the tree line on the school campus or in the outdoor courtyard area. Walks taken indoors took place in the hallways of the school. On days when no walks were taken, the students remained in their classroom.

Data Collection Procedures

The observations of students in this case study took place on Fridays during fifth period (12:54-1:57) over a six week time span. This class takes place one hour after their lunch break. On some days the students were taken for a walk along the tree line for about twenty minutes before regularly scheduled tests take place. Other days, at the same time, the students were taken for walks indoors or allowed to play on the computer, which is their usual activity at that time. The observations took place at the same time, on the same day of the week, over several months. When the group was taken outside, they were accompanied by the researcher and one other adult (a teacher assistant). The amount of socializing, both among the participants and with the researcher/observer, were kept to a minimum so that it is not introduced as an additional variable. The researcher used observations to determine if there were noticeable differences in the behavior of the children after the different activities.

The researcher remained for the rest of the class to observe the students' interactions with each other and record their behavior. A tabulation was kept on some particular behaviors, such as talking out and getting up without permission. This was done on the participant group as a whole and not on individuals. A copy of this tabulation form is included in the appendices.

After each observation, the researcher conducted a short interview with several students, one at a time. These were informal in nature and took place at the end of the class period with minimum disruption.

After each class was over, the researcher interviewed the teacher of the participant group. These were semi-structured interviews with several open-ended questions. After the final observation, the teacher shared the grades that students received on tests taken on relevant afternoons and the researcher recorded them under the participants' pseudonym, by subject. These were looked at by the researcher during the collection phase to determine if a pattern could be present.

At the conclusion of the data collection phase of the study, the researcher gave a simple survey form to the participants. The researcher read the questions and answers to ensure understanding. After the surveys were finished, the participants were rewarded with a basket of school supplies, fun stickers and treats.

Survey Instrument and Protocol

In qualitative research, the researcher is the primary instrument for collecting and analyzing data (Ary et al., 2006). This is because only humans can adapt and respond appropriately in settings where the complexity of the human experience is what is being studied. There is also a quantitative component to this study that helped to corroborate the observational data (tabulations, test scores, and survey results). The researcher was a participant observer in this qualitative case study. The researcher kept a journal of field notes and also kept observer comments (researcher's reflections) in the same journal. These notes included observed behaviors as well as verbal comments by the participants relevant to the nature of the study, such as described feelings.

The participants were each given a letter (*A, B, C, D, X, Y, Z*) that correlate to their names on a list that was kept in a locked box until the study was concluded, at which time they were shredded. Within the researcher's journal and in any papers written based on this study, pseudonyms were used to protect the anonymity of the participants.

Simple background data was collected on the participants and recorded in the journal along with pseudonyms. The initial data collected was in the form of observations and will be kept in the

researcher's journal. The researcher observed how the participants behaved inside their classroom both in their interactions with each other and their overall demeanor. When the participants were taken outside, the researcher again observed their interactions and behaviors.

After each session, whether with a walk outside or not, each student participated in an individual semi-structured interview. A semi-structured personal interview is similar to an unstructured one in its flexibility, but does include questions that can be tailored and modified depending on the direction of the interview. The interviews were conducted with a conversational feel in order to put the participants at ease. Close observation of the participants while they answered the questions took place and was noted on the interview form. Personal interviews conducted in a face-to-face setting allow the researcher to observe the participant while he/she answers the questions. The researcher can repeat questions or reword the questions if the participant appears confused (Ary et al., 2006). Most of the questions were open ended. The researcher interviewed the students individually after their walks to determine how they felt and, when possible, to compare that with how they felt before the walk. On days when they did not take walks, the researcher interviewed them in the same way. Questions were general at first and the researcher allowed participants to control the direction of the interview within predetermined parameters. The researcher guided (without leading) the participants to discuss feelings that might have an effect on their ability to focus on academic work, such as mental sharpness and positive attitude. The interviews took place at the same time of day. A copy of the interview form can be found in the appendices.

Additionally, at the end of the school day on which the observations take place, the researcher received a list of the grades that the participants/students earned on their regular tests that they took on observation days and these were recorded in the journal (labeled only by pseudonyms). These were looked at to determine if the grades were generally any different on days when the students walked outside. Where a pattern was revealed, the test scores were evaluated using a correlational method to

determine if there was a statistical significance (discussed later in Data Analysis section).

When observing the participants inside the classroom, the researcher used a list of behaviors and made a mark by the appropriate category whenever any of the participants exhibited the behavior. The tabulations were not counted on individual participants, but on the group as a whole. If the tabulations reflected a pattern, they were examined closer to determine if a correlational method of analysis should be done to determine significance (discussed later in Data Analysis section).

Finally, the students and the teachers were given a survey after the above data had been collected and their participation was no longer required. The surveys had a blank at the end for them to describe what difference the walks may have had for them individually. For the students: Did it help them? Did it allow them to refocus and feel mentally refreshed? For the teacher: Do you feel that the students were able to focus on their work more? In your opinion, does the academic work seem to reflect this? These final questions give the surveys a qualitative conceptual aspect to them and the written survey allows for an anonymous response (unlike the interviews).

Ethical Considerations

The participants of the study are all human minors and so written consent/permission is required from their parents/guardians. The parents were informed in writing of the nature of the study and the possible benefits to the children. They were informed that the study would take place during a time that would otherwise be considered free-time and so academic instruction would not be missed. They were informed if, at any time, for any reason, their students wished to discontinue with the study that they could do so without any negative impact. The students were also informed verbally about the previous information. A copy of the consent/permission form can be found in the appendices.

Data Analysis Procedures

Data analysis can be complex in qualitative research. The collection of field notes, interviews, surveys, and journal observations was examined and interpreted (Ary et al., 2006). This study is a case

study with multiple participants and there were many pages of observations to be analyzed.

The first step was in familiarization with the data and organizing it. The notes were read several times through. A reflective log was kept that tracked the researcher's thoughts and opinions on the data as they occurred. The data was then coded and reduced. At this point, categories and themes were identified and data organized into smaller more manageable collections.

Embedded analysis seemed to be most the appropriate since the researcher was focusing on the behaviors exhibited by the students after their nature walks. This behavior was compared to their observed behavior on days when they were not taken for walks outside. The researcher produced a narrative in which interpretations were made of the data that was collected. This narrative can be found in chapter five. These interpretations occurred during the study as well as after it was concluded. The direction of the study could have been redirected depending on the observations.

After the first observation, initial coding began and was an ongoing process. It involved going through the researcher's field notes, student and teacher interviews, and teacher observation data. The next step was coding them with general terms, noting specific behaviors. The researcher examined, compared, and looked for similarities throughout the data. This was combined with the behavioral counts that were made, and patterns were sought.

If a pattern seemed evident in the scores of regular classroom tests from the same subject on the same day as the observations (which were recorded by pseudonym in the journal), Pearson product-moment coefficient were used to determine the correlation. Excel was used and the variables were minutes spent outside on a given day and test scores from that same day. Correlation was calculated and the researcher compared it to a graph to determine if the correlation was statistically significant.

The final surveys were coded in a similar fashion to the interviews and the behavior counts. A copy of the survey and the tabulation sheet is included in the appendices.

Summary

This case study explored whether any differences in behavior might be observed in a small group of middle school students with ADD/ADHD after a brief exposure to nature. This chapter describes the methodology that was used in this case study in detail. Starting with observations of the students and then individually interviewing them, the researcher got to know the normal behavior patterns for this group of students. As the study unfolded, the researcher continued to observe and record these observations, which were made under different settings. Patterns were sought and examined and finally written in a narrative fashion.

It is the sincere hope of the researcher that this study provides enough depth of understanding of the participants that it can be a stepping stone to further research in the area. The researcher had some advance knowledge of the participant group due to having had some of them as students in a visual arts class. The researcher is familiar with the struggles that these children deal with on a daily basis, compounded by the fact that their issues often take classroom instruction time away from other students. Due to these established problems, the researcher understands that this study will do no harm and possibly do some good. Furthermore, the implications of reducing pharmaceutical dependence, which is discussed in the literature review, may help other aspects of the lives of the participants.

CHAPTER 4: Results

Presentation of the Findings

This chapter presents the findings from the current study, beginning with a recapitulation of the purpose for the study. This is followed by a short description of the pilot study and a more in-depth discussion of the findings. The findings are presented in chronological fashion. This approach is designed to facilitate the reader's understanding of the processes involved.

The purpose of this study was to examine a group of individual students who typically experience very little time in nature, both during the school day and at home. The idea for this case study began as a realization that many of the students who live without daily exposure to nature have been diagnosed with ADD/ADHD. The diagnosis of ADD/ADHD indicates a lack of ability to focus and concentrate (Gorden, 2008). A lack of focus has been connected to attention fatigue. Persons with attention fatigue have been shown to benefit from the restorative properties of nature (Kaplan, 1995). The combination, and possible connection, of these seemingly disparate ideas forms the basis for this study.

Kuo and Taylor (2004) theorized that exposing young people to nature during the school day could help ameliorate the symptoms of attention fatigue which they believed could lead to better focus in the classroom. This case study observed students with ADD/ADHD before, during, and after a brief exposure to nature during the school day. A case study is appropriate for this population since one of the hallmarks of ADD/ADHD is that the symptoms are not consistent (Gorden, 2008) and observing behaviors over time can be enlightening. Observing the participants over several weeks under different conditions, including walks in nature, gave the researcher a better understanding about what might affect their behavior. The overall purpose of the study is to add one more piece to the puzzle about the possible connection between a lack of exposure to nature and ADD/ADHD.

Before beginning the actual case study, the researcher performed a pilot study with a group of

8th grade students. The pilot study was designed to determine the legitimacy of interview questions as well as to flag any logistical issues that might need to be addressed when taking students on a walk outside of the school building. The pilot group consisted of 30 students of mixed abilities. No action was taken to determine if any participants had previously been diagnosed with ADD/ADHD. Participants were asked only about allergies that might be relevant to the situation. The students were taken on a 20-minute walk around the school building. Potential interview questions were given to the students upon their return to the classroom. The questions were posed to the class as a whole and students were asked to write their answers on a blank paper. No names were used. The answers were carefully reviewed by the researcher and the papers were subsequently shredded. After consideration, a few of the interview questions were simplified for clarity. The logistics were carefully reviewed and amended to ensure the safety of all student participants while out of doors.

Interestingly, immediately after the initial pilot study, the students involved appeared to be more able to focus on the tasks at hand once they returned to the classroom. To determine if this was the result of having experienced an event out of their routine, the researcher continued to take this same class on 5 to 10 minute walks almost daily for four weeks. On some days inclement weather did not allow the researcher to take the students on walks. A short discussion of these findings appears in Chapter 5.

Participant Demographics

The study participants were all members of a 6th grade intervention/enrichment class. All of the students were determined to need extra help with mathematics and receive that help three days a week in this class setting. The class consisted of seven students (four girls and three boys). All of the students have received a diagnosis of ADD/ADHD, among a range of other issues.

The class met in a small classroom at the end of a hall. The room contained two large teacher desks, several desktop computer stations, and 10 student desks. The student desks were arranged in

two groups with each student facing one other. There was one large window in the room with a good view of a beautifully landscaped tree, but the blinds were usually kept shut. There was no artwork on the walls and no house plants or class pets.

This specific class was chosen for several reasons. First and foremost, the high incidence of students with a diagnosis of ADD/ADHD was critical to the study, and in such a small class could be observed without distraction. Other factors unique to this class are the time and day on which it falls. The class met on Friday, which is the day of the week in which many students seem distracted in anticipation of the impending weekend and also the day that this class typically takes achievement tests. The class was observed from late November through December which, due to holiday celebrations, is often a time of increased excitement and distraction. Finally, the class met during fifth period, which was the class immediately following lunch at the research school. Through both personal observation of the researcher (a veteran teacher) and informal interviews with other teachers, the researcher expected this to be the time of day in which students would be the most easily distracted from academic work.

For the purposes of reporting in this paper, all students will be referred to by italicized letters. The girls will be letters *A* through *D* and the boys will be *X*, *Y*, and *Z* in order to preserve anonymity.

Observations

The observations of the students took place over a five week time frame with the researcher spending one hour with the class at the same time each week. The specific results of these observations are detailed in the following section.

First observation. During the first observation, the researcher sat in the back of the class and took notes on what was happening in the room. The notes were very detailed and include any interactions between the students, as well as their participation (or lack of) in class activities. Also kept was a running tally on student behaviors that might be considered negative by the teacher, for example,

speaking out without permission or leaving a seat. A copy of the checklist can be found in the Appendix E. The teacher began the class with a short lecture, using a white board to help illustrate math problems. The students then participated in a question and answer session to review. After the review, the teacher had half of the students complete worksheets while the rest played games in order to practice the reviewed skills. After 10 minutes, the groups switched activities. The researcher did not interact with the students on the first visit, but used the time to observe student behavior before any interventions took place.

Student *A* appeared very calm and simply stared at the board while the teacher explained and illustrated the lesson. She appeared to be paying attention to the discussion, but did not participate. When the teacher tried to include her in the discussion by asking her questions, *A* just nodded. When her group was instructed to be complete the review worksheet, *A* played with her pencil and did not attempt to solve a single problem. Her demeanor was very amiable and calm. If asked, she professed to understand the lesson, she did not actually do or say anything that would indicate even a mediocre grasp of the concepts involved.

Students *B* and *C* were much more actively involved. *B* was very anxious to answer questions and would anticipate what might be asked and call out the answers without permission. She seemed very eager to learn new concepts and demonstrate her grasp of the material. She often got the answers correct, but her impatience in answering before the questions were fully formed reduced her chances dramatically. While this was a source of frustration for her, she was unable to control the impulse to shout out what she anticipated the answer to be. *C* also shouted out answers without waiting to be called upon, but her answers seemed to consist more of guesses than actual attempts at solving the problems at hand. A kind of rivalry began between *B* and *C* in getting the answer out first without regard to the accuracy of the answer. Each time this occurred, the teacher would remind them to raise their hands before shouting out the answer. The other students became more reticent as the lesson

progressed and the girls continued their competition. Student *D* was absent the day of the first observation.

The boys, *X*, *Y*, and *Z*, all fell within the spectrum of behaviors exhibited by the girls. *X* was quite animated and wanted to answer all questions before *B* and *C*. As with the girls, the competition seemed more important than the learning. Answering first, even if the answer was wrong, seemed more satisfying than thinking through the posed problem. When attempting to complete the review worksheet, he needed several reminders to remain on task. He was very easily distracted. Knowing that he needed to finish the worksheet before he would be allowed free time on the computer, he attempted to hurry, and as a result, the accuracy of his answers suffered.

Y was more thoughtful, and while slower in answering questions, his answers were more accurate. While working independently on the worksheet, he became quite frustrated when he was not sure of what his next move should be. Unlike the others, he really wanted to learn the material and get correct answers. Unfortunately, he would become so frustrated when unsure that he would just stop working and put his head in his hands. When this happened, if the teacher noticed, she would help him work through his difficulties. He would then continue on his own for a period of time before coming to another stumbling block and once again collapsing into his hands. *Y* repeated this behavior pattern for the duration of the class.

Z was similar to *A* in both his seemingly attentive attitude and his lack of apparent understanding of any of the material. He did not complete a problem and barely touched his pencil to the paper. He, like *A*, was not disruptive and was very amiable when the teacher would suggest that he do some work; but in spite of his seeming willingness to complete his work, he accomplished nothing.

The students were observed by the researcher for a total of one hour on the first observation. There was very little interaction between the researcher and the students. The researcher informally interviewed the teacher after the observation and was assured that the observed class was very typical.

The behaviors of each participant/student were what she would expect from each and what she had observed herself daily. Students were interviewed, and the interviews produced no surprising results. Overall, the students indicated that they held positive feelings about the school. They reported that they spent very little time outside while at school or at home, both in the evenings and on the weekends. A blank copy of both teacher and student interview questions is included in Appendices C and D, respectively.

Second observation. The second observation took place the following Friday, which coincided with the school's Veterans Day program. This was a program which was open to, and geared towards, veterans and their families. The researcher accompanied the students to the program, which lasted for the first half of the class. The researcher then returned with the students to the classroom for an abbreviated lesson. The program took place in the gymnasium of the school and consisted of several speakers, choral and band selections, and presentation of flags to certain audience members. The program was not designed for a middle school audience, but rather the veterans and their families.

Observed student behavior during the program was good, even better than might have been predicted based upon the mature content of the program. The students all paid attention to the speakers, clapped when appropriate, and did not exhibit negative behaviors such as talking or leaving their seats. Upon returning to the classroom, however, the behavior within the class was markedly different from that of the preceding week. Once again, the researcher sat at the back of the class and observed by taking extensive notes and using the system of tally marks on the behavior checklist.

The interruption in the students' schedule exaggerated the behaviors that had previously been observed. *A*, who previously had seemed attentive but did not actually do any work, simply stared at the wall. She did not look at the teacher or try to answer any question. *B* and *C* were barely able to contain themselves and talked over each other and the teacher. *D*, who had been absent the previous week, was quiet and withdrawn to the point of not responding orally, even when asked a direct

question.

The boys, X, Y, and Z, all displayed exaggerated behaviors as well. This was in direct contrast to their behavior during the program, which was exemplary. The students who the previous week had been quiet and withdrawn, were more so; while the students who were effusive and active could barely stay in their seats.

The researcher informally interviewed the teacher immediately following the class and found that she was exhausted by the experience. The teacher stated that their classroom behavior was always difficult for her to deal with following any disruption in their schedule. This made the researcher further appreciate the opportunity to observe the students' behavior when the disruption would involve a walk in nature, as was the plan for the following week. The student interviews were difficult to conduct as the students were distracted to the point of having trouble answering the questions. The overall positive feelings toward school, however, remained.

Third observation. The third observation began with the teacher announcing that the class would be going for a walk outside with herself and the researcher. The students seemed excited to be doing something different. They were told that the walk would take approximately 20 minutes and that their regular class would start upon the return to the classroom. It was a mild, sunny day and the students wore sweatshirts or light jackets. The researcher led the students through the office area and out the front door to a small wooded area. The students talked animatedly with the researcher about various topics, mostly pertaining to previous outdoor experiences. Without provocation, they picked up sticks and leaves to examine more closely. One student remarked about the bark on a nearby tree and the rest joined in on a close up examination of the bark, followed by a discussion of what type of tree it was. The researcher then led the students to a small historical building on the school property and circled it several times with the discussions mostly about the material from which the building was constructed and the original uses for the building. (The building was a former school house.) The walk

continued along the edge of the school grounds, keeping close to the trees lining the campus. After 20 minutes, the teacher, researcher, and students returned to the classroom.

After returning to the classroom, the students took their seats and got out pencils in anticipation of the impending lesson. The researcher once again sat at the back of the room and observed. The teacher began the class as she had the two previous observations with a lecture-style lesson on the white board, followed by a discussion session. While the format of the class was the same as it had been during earlier observations, the reaction of the students was very different.

A, who had been quiet and vacant, was actively participating in the lesson. She paid close attention during the lecture and then raised her hand to answer questions during the discussion. She appeared to be actively engaged in the lesson. During the individual worksheet review, she worked on several problems. Although she worked slowly, it was the first actual work that the researcher had witnessed her doing.

Both *B* and *C* participated in the lesson, as well as the discussion. They were animated and eager to answer, but both seemed content to wait for the teacher to ask questions and give others a chance to answer before yelling out what they thought might be the answer. There seemed to be less competition and more thoughtful discussion compared to earlier observations.

D was quiet and thoughtful and, unlike the previous week, answered questions when asked. She took her time in responding, but was correct most of the time. She was thorough in her worksheet practice and even helped *A* when she was stuck on a problem.

The most obvious change in behavior was with *X*. While he had been overexcited and could barely remain in his seat during the first two observations, he was much calmer during this observation. He sat still and listened to the teacher as the lesson was introduced. When the teacher asked questions, he raised his hand and answered accurately. The previous competition between him and the girls was undetectable. His demeanor was much more agreeable. When the students began to work on

individual worksheets, he stayed on task and did not need to be reminded to keep working. He seemed startled when the class bell rang as he was still engrossed in the work.

Y was similar in demeanor to previous class sessions. He listened to the lecture and participated in the discussion. Where he seemed different from previous observations was in the low level of frustration that he displayed while working on the independent worksheet. He did not get as caught up in a loop of anxiety each time he came to a part that he did not understand. On two occasions, he asked for clarification with a part of a problem. In both instances, the teacher was able to direct him with very little guidance.

There was little discernible difference in student *Z*. He still seemed to barely able to grasp the material and did not participate in the discussion or the attempt much in the way of independent work.

The student interviews revealed that the students enjoyed their time out of doors. All students felt that they were better able to focus and concentrate on the lesson after going for a short walk. They reported more enjoyment of the lesson and the subsequent independent work.

After the class, the researcher informally interviewed the teacher. The teacher opined that the students were unusually calm during the class. They were focused on the lesson. They were not overly competitive with each other at the expense of learning the material. The teacher was especially interested in the fact that *A* was focused and able to listen to the whole lecture, as well as participate in the discussion.

Fourth observation. On the fourth observation, the students once again went on an outside walk with the researcher. The weather was cool, but clear, and required only light jackets. The student participants were all looking forward to the walk and were animated and excited. The route was similar to the third observation, but did not include any exploration of the historic school house. The pace of the walk was slow with many stops to investigate natural objects. The students seemed to enjoy discussing the types of trees and plants on the school grounds. They also were enthusiastic about

relating stories of their experiences and knowledge of nature. Often, the stories that at first seemed to be memories of experiences were actually memories of television shows that they had watched. The participants became less animated after about 10 minutes and seemed content to walk and observe the natural surroundings. After another 10 minutes, the students and the researcher returned to the classroom.

Upon returning to the classroom, all of the students sat down at their seats and prepared to listen to the teacher's lesson. They sat quietly waiting for her to start. The lesson was to be on fractions and the teacher had previously confided to the researcher that these students often had trouble with the concept.

As the lesson began, *A* watched the teacher assiduously. She listened to the teacher and raised her hand to answer a question posed by the teacher. While her answer was not correct, it was the first time that the researcher observed this student attempting to participate in the discussion. Once the lesson progressed to individual practice, *A* worked on her worksheet the entire class. At one point she approached the researcher and asked for assistance on a problem. She listened to the researcher's guidance and applied it to her worksheet.

Both *B* and *C* paid attention to the lesson. While they were enthusiastic about the lesson, they did not interrupt the teacher and raised their hands when they wanted to speak. They both finished their worksheets with time to spare in the class, which allowed them to have some free time on the class laptop computers. *D* once again paid attention to the lesson and while she did not participate actively in the discussion, she did perform admirably on her worksheet, scoring about half correct.

X seemed very enthusiastic about the lesson. He did not call out answers, as he had during the first two observations, but raised his hand in response to all questions posed by the teacher. He remained in his seat, although he did sit on his feet and tapped his free hand on his desk.

Y was very successful while working on his worksheet. He did not ask for help, but instead

stayed focused on his work until it was complete. There was no obvious frustration while he was working.

Z did not ask or answer any questions during the discussion, although he did appear to listen to the lesson. While he was somewhat distracted while working on his worksheet, he did spend time attempting to work out the problems on his own.

The researcher interviewed the teacher immediately following the class. The teacher was very surprised that the students did not have as much trouble with the lesson as she had anticipated that they would have based on her prior experience. The teacher was most impressed by the behavior of X. According to the teacher, X has had a great deal of trouble remaining on task during class the academic year. The teacher was glad to see him better able to cope with the requirements of attending a class without interrupting. The student interviews were similar to observation three and were overall very positive.

Fifth observation. The final scheduled observation took place on a very cold day. Since several of the students did not have warm coats, the teacher and the researcher agreed that taking them outside would not be prudent. The researcher returned to the practice of observations 1 and 2 and sat in the back of the class.

The class began as it had each time before. The teacher introduced the topic and began a review of an earlier lesson. Within the first minute of instruction, B yelled out that she already knew how to do the work. After her outburst, C called out that she also knew how to do it. Neither girl raised her hand prior to making these comments. The teacher continued with the lesson until X stood up and said that he found this lesson to be very easy and remembered how to do it. The other students remained quiet.

A watched the teacher explain the lesson. She did not call out or get out of her seat, but neither did she raise her hand. When asked a direct question, A answered in a manner that demonstrated that she did not fully understand the question. The teacher explained it to her, but while she was occupied

with *A*, several other students (*B*, *C*, and *X*) began to talk to each other about unrelated subjects. *A* was able to answer the posed question appropriately after five minutes of additional instruction by the teacher. During this time, *Y* began to get frustrated by the pace of the class. He started tapping his foot and then his pencil. This further distracted *B*, who began to berate *Y*.

Overall, the class was much less focused on the lesson. When the individual work began, the focus of the students further unraveled. By the end of the class, only *D* remained focused and working. *Z* mostly sat quietly with his hands clenched and his chin on his desk.

Student Interviews

The student interviews were informal in nature. The researcher wanted to get honest, forthright answers instead of having the students answer in a way that they thought might please the researcher. For this reason, the questions were posed in an open-ended manner in order to elicit a true response. A copy of the questions is included in the Appendix D. The questions are first written to explain what information the researcher really wanted to procure. In italics after the question are examples of what the researcher would ask the student in order to determine the answer to the question. This section follows the interview results of *X* since his behavior was observed to change the most dramatically with the addition of the walk in nature.

The first question that the researcher asked was posed to determine whether the student had positive feelings toward school in general. If the student had mostly negative feelings toward school, his/her response to a brief exposure to nature might differ from a student who was more content. One way that the researcher determined the overall positive or negative feelings about school was to ask if the student liked school and if he/she had a special group of friends at school. Having friends at school often corresponds to positive feelings about school. The students invariably reported positive feelings toward school in the interviews. *X* answered with enthusiasm that he “loved school” and had “tons of friends” whenever he was asked. He stated that although he “loves the whole day”, he prefers “math

way more than social studies”. His answers did not vary on days when he went for a walk from on days on which he did not. The difference was in his ability to sit calmly and make eye contact with the researcher. On the days in which he went for a walk, he sat still and waited for each question to be asked while on the other days, he seemed agitated and distracted.

The next interview question was targeted to discover if the students enjoyed their walks outside and this question was only asked on days on which a walk took place. The students were asked if they liked the walk, if they liked being outside, and what they liked best about the time outdoors. Once again, the answers were all positive. X responded that he liked the walk very much. He said that he did not spend much time outside and that at home he usually plays video games instead. His favorite part of the walks was getting a break from school and also picking up sticks.

Another important consideration for the researcher was to determine if the students could tell a difference between the way they felt before a walk and after a walk. This question was designed to determine if the students were consciously aware of feeling calmer after the walk, as was evidenced by their behavior. During the pilot study, the 8th grade students were adamant that they remembered feeling more anxious and stressed before the time spent outside than afterward. The 6th grade case study participants, however, did not seem to have a clear idea of this. X reported being “kind of sleepy” before his walk and “more awake” afterward. This was a typical response. He could not be more specific when asked about feeling more focused. The data gathered from the interviews reinforced data gathered from the observations.

Teacher Interviews

The researcher informally interviewed the teacher immediately following each class in which the students were taken for a walk. Her responses were very similar on both occasions and are reported together. The teacher was asked if the children seem focused and on task before their walk outside. She responded that they had not spent much time in the classroom before the walk and were excited to

get outside, so she could not speak to their focus before the walks. They were not what she would consider to be focused, but she really would not expect them to be at that time.

The next question concerned whether or not the teacher thought that the walk outside made any difference. On both days when the students went for a walk, she was enthusiastic that it made a difference in their behavior. The teacher was not sure why, but she did think that the students were better able to focus on the lessons after the walk outside. While she was not able to commit to a theory as to why that was, she did notice a difference in their overall demeanor. She could not name any other activities that the students had participated in where she had noticed a similar calming effect.

The researcher and the teacher discussed the specific behaviors of X. It was the teacher's contention that his behavior seemed to be particularly affected by the walks. The following statement was made by the teacher after the fourth observation. “(X) really benefited from the walks. He was able to accomplish more in the 40 minutes left in class after a 20 minute walk than if he had spent the entire 60 minutes in class.”

Student Final Survey

The students completed the final surveys at the conclusion of the case study. A blank copy of this survey is included in the Appendix F. The researcher read the questions aloud to the students in order to make sure that all students understood what was being asked. They wrote their answers on individual papers. All students reported that they enjoyed their walks outside and several stated that they wished to continue the practice. All seven respondents answered that going for a walk outside made the rest of the class seem easier.

Teacher Final Survey

A blank copy of the post-study survey that the teacher completed is included in the Appendix G. The following sentence is in response to the question of whether she felt that her students benefited

from the nature exposure. “ Yes, I feel that my students were calm and ready to work. I enjoyed the time out of class to socialize and build relationships with my students.” The researcher had not previously considered relationship-building within the class as part of the reason for improved behavior, but the teacher felt that it was.

When asked if the students exhibited any obviously different behaviors on days when walks were scheduled, the teacher replied that one of her students was much calmer, and that another was more attentive and focused. When the researcher followed up in person, the teacher identified the students as *X* and *A*, respectively.

To the question of whether the teacher felt that a brief walk in a natural setting would be a good addition to the school day, she answered that “ yes, all students could benefit from a scheduled brain break.”

Incidence of Negative Behavior

Throughout the study, the researcher kept track of certain behaviors that would be considered to be negative or counterproductive by the teacher within the class setting. The researcher concentrated on three behaviors; talking out without permission, being off task/daydreaming, and being out of seat without permission/getting up. The occurrence of each behavior that was observed during the final 40 minutes of each class period was recorded as a tally mark on a form by the researcher. A blank form is included in the Appendix E. Each mark represented an observed incidence of the behavior within the class as a whole and not by any individual student. Since there were two observed classes where the students were taken for a walk and three classes where they were not, the totals for each category were averaged. The results are depicted below in chart form.

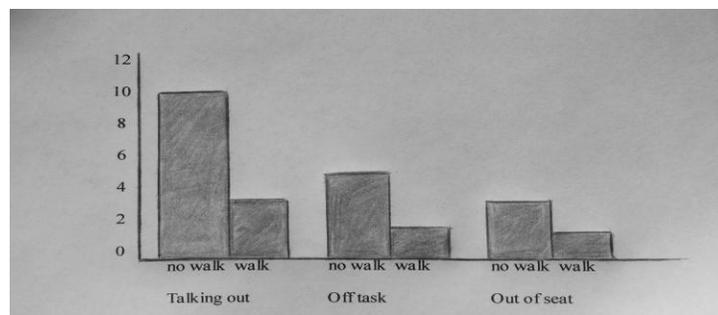


Figure 4.1 Incidence of Negative Behaviors

Effect on Grades

While the behavior of most study participants showed enough of a pattern to discuss the results, the grades did not show a similar pattern. No pattern could be found in the grades that participants received on quizzes that were administered on the days that the observations took place, except for those of one participant. The specific results for most are not reported. The one exception to this was in the grades that X received on math quizzes administered later in the day on the days of the observations. The results are shown below in Figure 2. Since there are only five grades, it is difficult to draw definitive conclusions, however, his grades were higher on the two days that walks took place.

A pictorial representation of the grades that X received on math quiz grades is found in Figure 2. The actual grades depicted are 50/100 on 11/4 (no walk), 50/100 on 11/11 (no walk), 70/100 on 11/18 (walk), 60/100 on 12/2 (walk), and 43/100 (no walk). Since there are only five grades, a statistical analysis would not provide additional information. If this case study were to be repeated on a very large scale, a Pearson Correlation Coefficient could be run.

Conclusions based on the lack of pattern in the majority of the participants' grades are discussed briefly in Chapter Five.

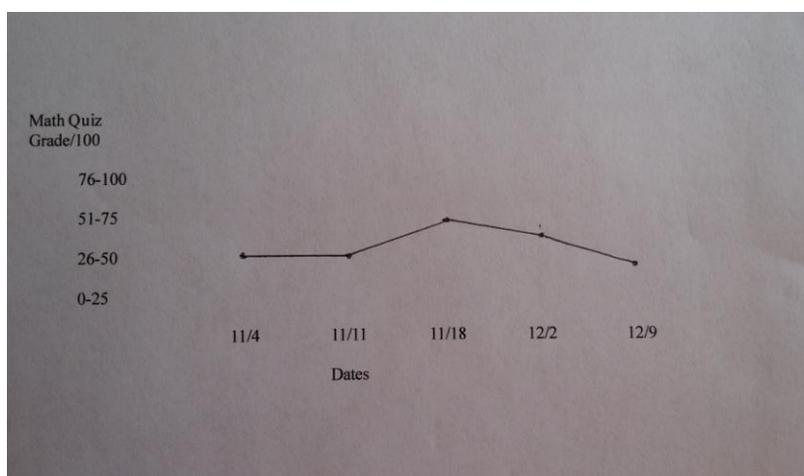


Figure 4.2 Grades for Student X

Summary

In Chapter Four, the results of the study are presented in narrative format in chronological order to facilitate the reader's understanding of the information as it was gathered. Also included are the results of student interviews, teacher interviews, and post study surveys. There was no attempt to qualify the results in this chapter. The researcher attempted to remain neutral and observe all behavior without drawing conclusions during the collection phase of the study. The seemingly dramatic differences in behavior of the student participants between the classes that were observed after a short walk in nature and those that were observed without the nature exposure could be attributed to many different factors. For example, the timing of the study, it being conducted in November and December, could have had an influence on the outcome. For this reason, the reader is to take the results for what they are and should not generalize the findings across other demographics. However, the results were quite dramatic and conclusions within the specific study group can be made and are presented in Chapter Five.

CHAPTER 5: Conclusions

Introduction

This chapter presents a short summary of the case study. This is followed by a summary of the conclusions that the researcher has drawn from the data reported in Chapter Four. Also included are implications for the study as it relates to the literature. Recommendations for further study and concluding statements complete the chapter.

Summary of Study

The study involved weekly observations of a class of 6th grade students previously diagnosed with attention deficit/hyperactivity disorder (ADD/ADHD). The students were observed in the class as it was usually held as well as on days when the researcher took the students for a short walk in nature before the class began. The behavior of the students on different days was compared to determine if the walk in nature would have any effect upon their ability to focus and pay attention.

The basis for the conjecture that a walk in nature may have an effect on behavior is found in the literature and described in detail in Chapter Two. Research has shown that there is a positive relationship between a brief exposure to nature and a reduction in mental fatigue. Mental fatigue is also referred to as attention fatigue, and can be the result of having one's attention directed toward a single stimulus, such as a classroom lecture, while simultaneously tuning out all competing stimuli. The symptoms of ADD/ADHD are similar to those of people experiencing mental fatigue. Would a brief walk in nature result in a reduction of the symptoms for the ADD/ADHD-diagnosed student? This question was explored by the researcher mainly through observations in this case study.

Summary of Conclusions

Before the actual case study began, the researcher did a pilot study with an 8th grade class of 30 students. This particular class was very talkative. The boys especially had a great deal of trouble focusing. This may be because the class was large, or possibly because it was the last class of the day.

The class was quite varied in ability and interest in the subject (visual arts).

The class was taken on a walk in the courtyard and then the researcher read them questions, which they answered on blank paper. The researcher utilized the answers to adjust the interview questions to be used with the case study participants. The class then proceeded as usual. The researcher was surprised at how calm and focused the class was after being outside for less than 15 minutes. The results were so dramatic that the researcher continued to take this class outside for 5 to 10 minutes at the beginning of every class whenever possible for the following four weeks. There are many factors that could have contributed to the behavioral changes that were observed in this group. One reason may be that they felt as though they were being rewarded for good behavior with an outside break. Another reason could be that as a group they felt that they were being treated with additional respect and acted accordingly. It is also possible that being outside in nature allowed for a reduction in mental fatigue that had built over the day. While the reasons behind the behavioral change are not known, the change was obvious to the researcher.

The case study was done utilizing observations over a five week time frame. Being able to observe the students over time allowed the researcher to become familiar with their usual behavior and notice any patterns or changes. The time frame was sufficient for the researcher to observe the students in several different situations. A longer time frame would have provided more information, but since the observations took place during the time between Halloween and Christmas, the student reactions to any stimuli, positive or negative, could have been described as exaggerated.

Since this is a case study, the findings should not be generalized across the population as a whole, however within this group, the findings were dramatic. During the first observation, the students did not go for a walk in nature, and the researcher found them to be easily distractible and unable to focus on the lesson for long without the teacher reminding them. This was the usual situation for the class, according to the teacher. The second observation also took place without a walk in

nature. At the beginning of this class, the students watched a band/choral performance and were subsequently even more distracted than during the first observation. The teacher became visibly frustrated as the class progressed.

During the third observation, the researcher took the students for a walk in nature at the beginning of the class. The behavior of the students upon returning to class was very different from what it had been on previous observations. The most dramatic differences could be seen in students A and X. A had previously been observed as not participating much in the class at all. She would not be disruptive to the class, but rather seemed to demonstrate a lack of engagement. Until the week of this observation, the researcher had not observed this student doing any work on her own without prompting. X's behavior also showed a positive improvement. Unlike A, his habit of yelling out answers without raising his hand was very disruptive to the class as a whole. After a 20-minute walk in nature, he was much more in control of himself. He was able to focus more on the work that was on the board and wait for permission to speak. His presumed need to compete with others to get an answer first, regardless of whether it was right or wrong, was not evident. He was able to put the emphasis on doing the work correctly rather than on doing it fast. The next observation also began with a walk and the results were as impressive as the week before. The walk had a dramatic and positive effect on the behavior of the students. This was observed by the teacher as well as the researcher.

The last observation did not begin with a walk. The student behavior was similar to what it had been on the first two observations (as is shown in Figure 4.1). The behavior reverted to what it had been before the walks were initiated.

Incidence of negative student behavior during the classes in which the students did not go on walks was much more frequent than during the classes that began with a walk. This indicates a possible restorative benefit of the walks, or at least a correlation. As discussed in Chapter Two,

negative behaviors can be the result of the mental fatigue caused by directed attention. Since the students went directly from one class to another where their attention is directed, it is possible that some or all of them may have been experiencing mental or attention fatigue. Several studies have shown that there is a correlation between exposure to nature and a reduction in attention fatigue (Kaplan, 1984; Hartig, Mang, & Evans, 1991; Cimprich, 1990; Canin, 1991; Gilker, C, 1992; Lohr, Pearson-Mims, & Goodwin, 1996; MacDonald, 1994; Ovitt, 1996; Ulrich, Simons, Losito, Fioriteo, Miles, & Zelson, 1991). This correlation could help to explain the lack of negative behaviors on days when the ADHD/ADD students were taken for a walk in nature since attention fatigue is one symptom of this disorder (Amen, 2015).

While behavior was more positive after student exposure to nature, subsequent quiz grades did not show any discernible pattern. One possible explanation for this disparity is that the quizzes were taken over an hour after the nature exposure. The benefits of nature exposure to the student may decline in efficacy after time spent once again in directed attention situations.

Implications of the Study

Since this was a qualitative case study, the implications for the classroom teacher would be dependent upon the reader's interpretation of the data. The researcher was a classroom visual arts teacher and as a result of the study, incorporated regular nature exposure into most classes. For the researcher, this included classroom plants, a fish tank, short walks in a courtyard, and classes held in an outdoor classroom whenever possible. These small additions resulted in positive behavioral changes within many classes. The dramatic changes in behavior among the study participants after the walks in nature were all positive. For a classroom teacher, the addition of short nature breaks, either in the form of walks outside or nature in the classroom, could aid in classroom management.

There are further implications for specific students within the case study. All of the students, with the possible exception of Z, exhibited positive behavior changes after the brief nature exposure.

Based on both the observations and the interviews/survey with the teacher, two students were particularly affected. *X* was much more able to focus on the lesson after the walk. His behavior was calmer and he seemed to be less hyperactive. The benefit was as dramatic for *A*, but was manifested differently. *A* was more alert and more focused on the teacher. *A* appeared to be more active as opposed to being less active. The walk seemed to benefit both students equally, but in opposite ways. The observation implies that benefits from a brief exposure to nature may be advantages to many different students without regard to specific needs.

Recommendations for Further Study

The case study was extremely interesting to the researcher, but had its limitations. The very nature of a case study is a limitation since the findings cannot be generalized over a larger population. The reader is free to draw his/her own conclusions and determine what to take away from the study and that could be different for different readers. More case studies done in similar fashion with different student populations could broaden the understanding of the usefulness of the findings.

The fact that there was no pattern found in the academic grades associated with the students, whether they were taken on a walk or not, is something that should be further investigated. The only grades that are mentioned in Chapter Four are those of *X*. *X* took a math quiz on the same afternoons as the observations, and his grades were better on the days in which he went for a walk. Since there are only five grades that could be fairly compared, the limited amount of data limits its usefulness. A slight improvement in his grades is shown on the days when a walk was taken, however. This case study evolved over a five-week period. A much longer case study, perhaps a full school year, might prove to be insightful.

The researcher has long term plans to instigate action research plans to be carried out by classroom teachers throughout the country. These would be conducted across demographics and include many different age groups. A great deal of information could be acquired if the teachers would

keep simple tallies of behaviors in their classrooms on regular days and on days in which they took their students out for a short walk. With more information, more patterns become evident.

Concluding Statements

This case study is one part of a more complex issue. The idea that something as simple as exposing students to the natural environment during the school day would improve their ability to focus is worth pursuing. Giving students a break from directed attention with something that engages their minds effortlessly and has no negative side effects should be fully explored.

The students who participated in the case study were observed to benefit from a walk in nature with improved behaviors that indicated an easier ability to focus on the lesson. While this study can only be definitive in conclusions within the context of the class that was observed, the implications of the observations are worthy of further study.

While there was no evidence in the case study of an improvement in grades when students spent time in nature, their behavior was improved to the point of not being distracting to other students. The class that was studied was not considered a regular general education class that typically has 20 or 30 students. There were only seven students, all diagnosed with ADHD/ADD, and in this class for extra help in mathematics. During the rest of the school day, these same students are placed in general education classes with other students. Their ability to focus and not exhibit distracting behaviors would benefit the students in their general education classes as well.

While merely conjecture at this point, the researcher has been noticing possible connections that exist in different fields that may be relevant to the long term study of the concepts being examined. For example, art therapy, visual journaling, and meditation all include using the non-verbal, right hemisphere of the brain (Diamond, Scheibel, & Elson, 1985; Ganim & Fox, 1999; Buchalter, 2009). The research referenced for this study describe the calming effect that nature can have on the brain in reducing directed attention fatigue (Kaplan, 1984; Hartig, Mang, & Evans, 1991; Cimprich, 1990;

Canin, 1991; Gilker, C, 1992; Lohr, Pearson-Mims, & Goodwin, 1996; MacDonald, 1994; Ovitt, 1996; Ulrich, Simons, Losito, Fioriteo, Miles, & Zelson, 1991). Is the same calming effect achieved by observing nature enabled by engaging the right hemisphere of the brain? Since nature can be complex and interesting but can be observed without conscious effort, might this be a pathway to right brained thinking and thereby give the left hemisphere a chance to rest? These are thoughts that are worth further exploration. For now, it can be concluded that giving some students a brief walk outside appears to help them control their behavior for a short time after returning to class.

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Appendix A

Letter to Parents/Guardians

Dear parent/guardian,

My name is Mary Bow. I am the art teacher at Jefferson Middle School. I am working on a doctoral degree in curriculum and instruction. In partial fulfillment of this degree, I am conducting qualitative research in the form of a case study. I am interested in the question of whether a twenty minute walk outside would have any effect on student behavior in class. The participating students will be accompanied by myself and a teacher assistant on their walks which will take place on Fridays, fifth period. I will keep a journal of observations on the children, but I will use only pseudonyms (code names) for them and they will not be identified by name in any paper connected to this study. They will subsequently be interviewed individually by me with questions that pertain mostly to how the outdoor exposure made them feel.

Accompanying this letter is a permission form that must be signed by you in order for your student to participate in this study. If, for any reason, you or your student do not want to participate, there will be no negative repercussions. He/she can quit anytime without any consequence.

Thank you for considering this request. There is no risk or danger to your child in participating in this study. He/she may possibly benefit from the outdoor exposure.

Sincerely,

Mary Bow

Appendix B

Parental Permission Form

Title: Effect of Exposure to Nature on a Group of Students: A Case Study

Please read this consent document carefully before you decide to allow your student to participate in this study. This research has been approved by the University Institutional Review Board.

Purpose of the research study: The purpose of this study is to examine what influence a brief exposure to nature might have on a small group of students.

Design of the Study: This is a case study involving a group of 4-5 students who will be taken for a walk outside on the middle school campus along the tree line or in the court yard during the school day. They will be observed and then interviewed to discuss their opinions about the benefit of the walk. On some days the observations will take place in the classroom. Some grades will be examined to determine if the walk has any effect on test scores. The scores will not be recorded by name.

Confidentiality: The identity of your student will be kept confidential to the extent provided by law. Your student's information will be assigned a code number and a pseudonym (code name). The list connecting students' names to this number will be kept in a locked file and shredded at the completion of the study. No real names will not be used in any report.

Voluntary: Participation in this study is completely voluntary. There is no penalty for not participating.

Right to withdraw: Your student has the right to withdraw from the study at anytime.

If you have questions, please contact: Mary Bow, marypbow@yahoo.com or 865-300-4618

Agreement: I have read the study described above. I agree that _____ (student) has my permission to participate in the study and I have received a copy of this description.

Parent/Guardian: _____

Date: _____

Appendix C

Interview Questions for Student Interviews

Numbered questions are what the researcher wants to know. Questions in italics are possible wording for the questions and will be used as the written questions for the pilot study. The interview will be researcher guided, but child directed within the parameters.

1. Does the child currently have positive feelings toward school in general?

Do you like school? Do you have a special group of friends at school?

2. Did the child enjoy the walk outside?

Did you like the walk? What did you like best? Did you like being outside?

3. Does the child remember how he/she felt before the walk? Is it the same?

Do you remember how you felt before the walk? Is it the same?

4. Does the child feel more focused and mentally sharp after having walked outside?

Do you feel really wide awake and pretty focused? Ready to take on the afternoon tests?

5. Does the child spend time outside after school or on weekends?

What to do you do for fun when you get home from school? How do you usually spend the weekends?

Appendix D

Interview Questions for Teacher

1. Did the children seem focused and on task before their walk outside?
2. Did the walk outside make any difference?
3. In your opinion, do any other activities elicit the same response?
4. Do you think that the outside time helped?

Appendix E

Tabulation/Behavior Counts

Talking without permission

Getting out of chair without permission

Wondering around the room

Not keeping hands to one's self

Fighting-verbal

Fighting-physical

Daydreaming

Leaning back in chair

Moving chair excessively

Other

Appendix F

Post Study Survey for Students

Did you enjoy your walks outside?

Did going outside make the afternoon classes seem easier?

What did you think of the study? Do you think that kids should take an outside break every day?

Anything else you want to add?

Appendix G

Post Study Survey

Thank you for participating in this study. Your cooperation is appreciated and your input is valued. Your answers to the following questions will help me in analyzing the data that has been collected.

Do you feel that the students benefited from the nature exposure?

As a class did they exhibit any obviously different behaviors on days when no walks were scheduled?

Do you feel that a brief walk in a natural setting would be a good addition to the school day?

Anything else that you'd like to add?