THE EFFECT OF FASCINATION TYPE ON ATTENTION RESTORATION, MOOD REPAIR, AND STRESS RECOVERY AS MEDIATED THROUGH RELAXATION RESPONSE IN COLLEGE STUDENTS VIEWING IMAGES OF ANIMALS

by

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STATEMENT OF DISSERTATION APPROVAL

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ABSTRACT

Today's college students face a number of new and demanding situations that deplete personal resources, leaving them mentally fatigued, tense, irritable, distractible, and physiologically stressed. One approach to replenishing these personal resources is to interact with settings that minimize the demands on those resources. A natural scene that a person perceives as fascinating could evoke a form of attention that is undemanding and virtually effortless. Exposure to pleasing natural scenes, such as harmless and attractive wildlife, may offer a means by which to capture a person's attention and begin a restorative process mediated by a relaxation response.

Using a 1 x 2 between-subjects experimental design, 86 participants drawn from the University of Utah Psychology Department's Human Subjects Pool took part in an experiment that examined the effect that scene type (images of wildlife theoretically deemed to represent either hard or soft fascination) had on a student's capacity to recover their mood (following a social evaluation mood stressor) and experience physiological recovery from induced stress. Also, between-subjects design was used to examine participant's executive, orienting, and alerting attention following exposure to hard or soft fascination images. Investigation into the role of relaxation in mood, stress, and directed attention recovery was also performed. Data garnered from the Attention Networking Task revealed no significant effect for executive attention. Stress reduction,

as measured by salivary cortisol, and mood repair were both significant, and partial mediation by relaxation was displayed for the mood measures.

The results indicated that relaxation was an effective mood mediator, contributing about 67% of the explained variance for scores on positive mood and 60% mediation for a negative mood. Relaxation was positively correlated with positive mood and negatively correlated with negative mood.

The findings from this study affirm the importance of relaxation as a mediating variable, but also demonstrate that perceptions of hard and soft fascination do differ in terms of mood repair. For directed attention restoration, fascination alone may be insufficient, with other attention restoration constructs (being away, extent, compatibility) being essential to replenishment of executive attention. Implications for both Attention Restoration Theory and Psycho-Evolutionary Theory are discussed.

I dedicate this dissertation to my husband, Ed, and my friend, Gloria, whose encouragement, support, and never-ending faith provided me with the Inspiration I needed to succeed.

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CHAPTER 1

INTRODUCTION

Life can be stressful. The stress of college life, in particular, is one example. College life can place heavy demands on a student's physical, emotional, and attentional resources. Paying attention to a myriad of necessary details can be stressful, and in many ways, energy depleting. The personal resources depleted may be both psychological and physical. Attentional, emotional, and physiological resources may be stretched to the breaking point. For instance, college students continuously exhaust voluntary, directed attention. Voluntary attention is the willful act of directing one's mental effort in order to "resist the attractions of more potent stimuli," or "discriminate a sensation amidst a mass of other sensations" (James, 1890, p. 416). When discerning specific stimulus patterns from among a myriad of patterns is essential to goal achievement, a person may have to apply mental effort to ignore irrelevant stimuli and attend to relevant ones (Schwartz, Ivancich, & Kaplan, 1997). The capacity to voluntarily direct attention allows a person to focus on complex, weak, ambiguous, or conflicting stimuli by blocking out competing distractions (Kaplan, 2001; Posner & Snyder, 1975). While striving to fulfill academic standards, many college students attempt simultaneous mastery of new life skills, such as learning to cope with a demanding course load, scheduling decisions, work, and career planning (Kanters, Bristol, & Attarian, 2002; Sell & Robson, 1998). This is a necessary

component of successful college student life. Each of those activities requires the effortful and often prolonged use of directed attention and voluntarily ignoring distractions.

Unfortunately, the capacity required to block out distractions is a limited resource (Posner & Snyder, 1975). Focused and demanding exercise of directed attention results in reduced ability to maintain such focused attention (Herzog et al., 1997). Depletion of this capacity makes one increasingly prone to distraction (Kaplan, 1995a; Parasuraman, 1998), and increasingly prone to errors in information processing (Herzog et al., 1997; Meijman, 1997). This results in what can be thought of as mental fatigue. Most people who suffer from mental fatigue become increasingly impatient, irritable, and less social (Herzog et al., 1997; Kuo & Sullivan, 2001). Control of emotions and their valence becomes more difficult.

Emotions are evolved situation-response systems that involve (a) subjective feeling states, (b) cognition and information processing, (c) expressive displays and behavior, (d) motivation, and (e) physiological responses. Emotions can be viewed as a loose and temporary coordination and synchronization of these systems (Lang, Rice, & Sternbach, 1972; Scherer, 1984). These systems originally evolved to organize and motivate adaptive, survival-promoting responses to environmental demands and opportunities (Levenson, 1994; Tooby & Cosmides, 1990). Regulation of emotion involves individuals consciously or unconsciously modulating one or more components of emotion, by modifying either their own experience/behavior/expression or the emotion-eliciting situation (Eisenberg et al., 2000; Gross, 1999). The types of stresses that result in mental fatigue can impair efforts at self-regulation through the induction of

negative affect. This often results in socially unacceptable behaviors such as heightened aggression (Donnerstein & Wilson, 1976), and difficulty with impulse control. Deep emotional exhaustion causes stress, and conversely, high levels of stress cause emotional exhaustion (McManus et al., 2002). Emotional exhaustion is often accompanied by negative affect. For students, moods can be negatively impacted by the demands of student life. Bad moods experienced frequently and deeply can reduce academic success.

Physiological stress is also a part of student life. A stress response is a physical reaction to a threat or challenge. While adaptive and even health promoting in small and infrequent measures, stress is damaging to mental and physical health at chronic levels. Continuing stress that must be endured has measurable effects on human physiology, such as elevated cardio-vascular responses that may ultimately lead to heart disease and stroke, and neuroendocrine responses that can also lead to a number of health problems. Chronic stress is associated with increased levels of the neuroendrocrine hormone cortisol, which not only harms cardiac tissues and suppresses the immune system (Sternberg, 2001), it also impairs memory retrieval, and selective attention (Kirschenbaum et al., 1996; Kulhman, Pell, & Wolf, 2005b; Posner & Snyder, 1975) both of which are critical to academic success.

Given the critical role that directed attention, affect, and physiological responses to stress have in the learning process and in supporting effective mental functioning in daily life, understanding approaches to facilitating student's restoration is valuable. Interventions that permit restoration of directed attention capacity, repair mood, and reduce physiological stress responses would be of value to students, instructors, administrators, and campus architects.

Viewing natural scenes or elements of natural scenes has been shown to often elevate mood, reduce physiological stress response, and restore depleted voluntary attention. For instance, researchers examining changes in affect in light of Psycho-Evolutionary theory have reported reductions of negative affect (such as feelings of anger and aggression) and an increase in overall positive affect such as perceived happiness, friendliness, or elation after viewing natural versus urban scenes (Hartig et al., 1991; Hartig et al., 1996; Hartig et al., 1997). Other research has provided support for the hypothesis that interactions with nature improve attention and memory (Berto, 2005; Cimprich, 1992, 1993; Cimprich & Ronis, 2003). It is hypothesized by these and other researchers that fascination with the natural world is instrumental in this emotional, social, and cognitive restoration process.

Fascination with natural scenes is thought to begin the process of attention restoration. Animals are often a fascinating component of natural scenes. Fascination with watching animals may produce important physiological changes in humans under stress (Ulrich, 1983; Ulrich, Dimberg, & Driver, 1991). Research specific to cortisol shows that interacting with therapy animals lowers cortisol levels in as little as five minutes (Barker, 2005). Although numerous studies have shown that watching animals and interacting with companion animals is therapeutic and restorative, the restorative effects of viewing wildlife in natural scenes has not been systematically examined.

It is possible that some animals may be fascinating in a way that does not result in beneficial cognitive and physiological health outcomes. For instance, untamed nature, in the form of animals capable of inflicting harm, instills fear in many people. Certain other animals generally elicit an immediate aversion or disgust response. Both fear-inducing

and disgust-inducing animals may prove to be quite fascinating, yet viewing such is unlikely to provide a cognitively, emotionally, and physiologically restorative experience.

Categories of animals generally considered frightful or disgusting may elicit a type of fascination that has been termed "hard" (Kaplan, 1995). A different kind of fascination may be elicited by animals that hold attention in a less demanding, less arousing fashion. This type of fascination has been termed "soft" (Kaplan, 1995a). The potential for beneficial health outcomes may lie in the difference between these two types of fascination. It seems reasonable that the difference between the two may lie in a mediating variable between types of fascination and any beneficial attentional, affective, or physiological outcomes.

Support for the presence of a mediating variable was found by Hartig et al. (2003) in blood pressure reduction in groups walking in natural as opposed to urban settings. They reported that the nature group "relaxed," i.e., returned to their resting rate, more quickly than the urban group. Rachel Kaplan (1973) suggested that nature was a place where people can thoroughly relax and temporarily forget about the worries or cares of the day, while Driver and Knopf (1976) expressed support for the importance of relaxation in nature in a study on perceived benefits of time in the outdoors among sport fisherman.

It may be, however, that other psychological variables influence beneficial health outcomes more than fascination. For example, anthropomorphism or a sense of connectedness, novelty, or familiarity may be among the driving forces that yield beneficial health outcomes (Epley, Waytz & Cacioppo, 2007; Zajonc, 1968).

Given the preliminary evidence in support of the influence of fascination on the

beneficial health outcomes of attention restoration, mood repair, and stress reduction through viewing restorative images, the following conceptual model (Figure 1), research questions, and hypotheses were proposed for this study:

Research Question 1

Is fascination related to three different kinds of restorative outcomes (attention restoration, mood repair, and stress reduction)?

$H_{1:}$ Response times will be shorter and error rates will be lower in the soft fascination condition than in the hard fascination condition.

Dependent variable: Attention Restoration (continuous)

Independent variable: Fascination (categorical)

Statistical procedure: ANOVA

$H_{2:}$ Mean scores on perceptions of mood elevation will be higher for the soft fascination

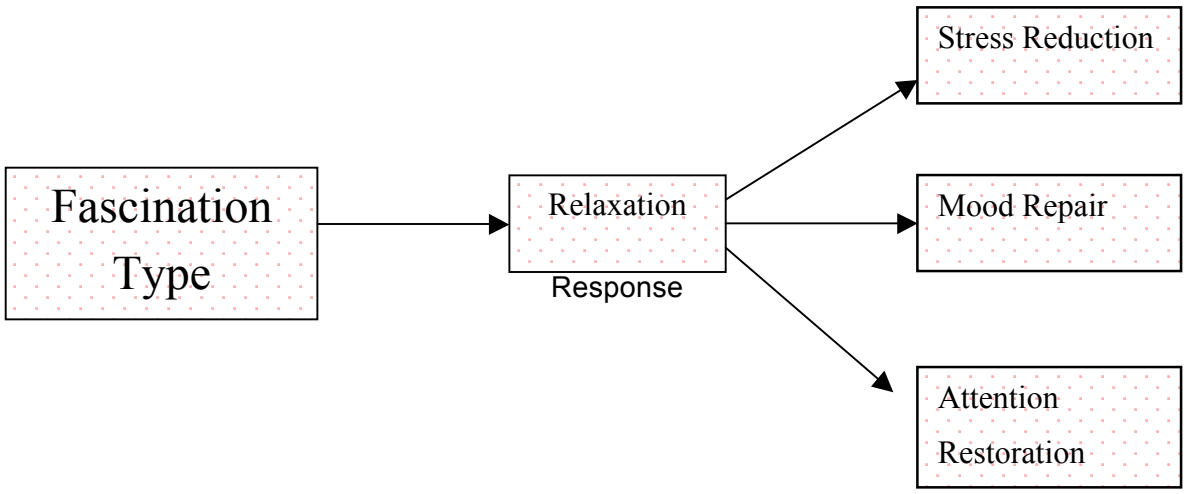

Figure 1.

Conceptual Model

condition than in the hard fascination condition.

Dependent variable: Mood Repair (continuous)

Independent variable: Fascination (categorical)

Statistical procedure: ANOVA

$H_{3:}$ Mean scores on salivary cortisol levels will be lower for the soft fascination condition than in the hard fascination condition.

Dependent variable: Stress Reduction (continuous)

Independent variable: Fascination (categorical)

Statistical procedure: ANOVA

Research Question 2

Are the effects of fascination on restorative outcomes mediated by relaxation?

$H_{4:}$ Relaxation will mediate the relation between fascination and restorative outcomes.

Dependent variables: Restorative Outcomes (continuous)

Mediating variable: Relaxation

Independent variable: Fascination (categorical)

Statistical procedure: Mediation Analysis (Kenny et al., 1998)

Delimitations

This study was delimited to college students, in the state of Utah, located at the University of Utah, between the ages of 18 to 50. The study took place between February 15 and November 5, 2012. Participants were primarily, but not solely, psychology undergraduates. This experiment was conducted with static images in a laboratory

setting, which may have elicited different responses from participants than live animals or moving images.

Definitions

Voluntary (Selective, Directed) Attention – the capacity for effortful selective interest in some object or task necessary for effective functioning.

Involuntary Attention – attention that is passive, reflexive, and effortless.

Affect – the immediate and transitory conscious experience of emotion (which is the behavioral, expressive, cognitive, and physiological changes that occur in response to a stimulus).

Mood - persisting feelings associated with evaluative and cognitive states that may influence future evaluations, feelings, and actions. Mood is more stable and less immediate and transitory than affect.

Self-regulation - the process through which people control, direct, and correct their own actions as they move toward or away from various goals.

Stress - the body's reaction to a change that exceeds a coping threshold and requires a physical, mental, or emotional adjustment or response.

Relaxation – a physical response in which the body moves from a state of elevated physiological arousal, to a state of reduced physiological arousal, where blood pressure, heart rate, digestive functioning, and hormonal levels return to their normal and optimal state. It may entrain cognitive reduction in hypervigilance as an ancillary response.

Fascination - setting or object's ability to grab and hold a person's involuntary

attention.

Hard Fascination - An effortless, automatically controlled, bottom-up response to an exogenous stimuli that results in immediate and fixed attention accompanied by elevated sympathetic responses, neutral or negative affect, and depressed function cognitive processes.

Soft Fascination - An effortless, automatically initiated then secondarily controlled response to an exogenous stimuli that results in immediate and continuing attention accompanied by modestly elevated sympathetic/parasympathetic responses, affect, and continuous interaction with top-down, higher function cognitive processes.

CHAPTER 2

LITERATURE REVIEW

College life can place heavy demands on a student's physical, emotional, and attentional resources. Significant stressors for college students include relationship problems and losses, academic demands, and financial issues (Renner & Mackin, 1998). Stressful academic demands often include taking and studying for exams, perceived grade competition, and the perception of large amounts of content to master in a small amount of time (Abouserie, 1994; Archer & Lamnin, 1985; Britton & Tesser, 1991; Kohn & Frazer, 1986). While striving to fulfill academic standards, many college students are attempting simultaneous mastery of new life skills (Aycock, 1989; D'Zurilla & Sheedy, 1991; Towbes & Cohen, 1996) such as learning to cope with relationship management (Renner & Macking 1998), a demanding course load, test taking, scheduling decisions, and career planning (Kanters, Bristol, & Attarian, 2002; Sell & Robson, 1998). Each of those activities requires the effortful and often prolonged use of directed attention, resulting in attentional fatigue. According to Tennessen and Cimprich (1995), college students continuously exhaust voluntary, directed attention. Other personal resources depleted in these endeavors may be emotional, and physiological, resulting in impaired life and academic performance. Many times all three of these personal resources

(attentional, emotional, and physiological) are simultaneously depleted through stress. Such depletion often results in failure to self-regulate.

Self-regulation as defined by Carver and Scheier (1998) is the process through which people control, direct, and correct their own actions as they move toward or away from various goals. Personal resources are brought to bear in this endeavor, such as specific kinds of attentional resources. Hobfoll (1989) suggests that people act to retain, protect, and build personal resources. He further states that the loss of resources, the potential loss of resources, or a failure to gain resources results in stress. Many goal directed tasks involve attention to boring or negative sources of information. This persistence in an unpleasant but necessary activity depletes physical, emotional, and attentional resources. Glass et al. (1969) found that stress did indeed exact a "psychic cost" that resulted in lowered self-regulatory capacity as measured by continued willingness to persist with a task in the face of mounting frustration. Such tasks are a normal and common component of student life. Successful coping with these activities influences certain academic successes. Students able to devote attention to both studies and self-regulatory internal states will likely succeed academically and enjoy healthier living than those less able to cope.

Many studies indicate that managing attention is the most common and often the most effective form of self-regulation. Attentional problems often precede self-regulation failures (Baumeister et al., 1994; Kirschenbaum, 1987; Wegner, 1994). An understanding of the importance of attention as a resource and how to manage and refresh that resource is of importance to students and educators alike.

Voluntary Attention

Voluntary attention is the capacity for selective interest in some object or task that humans need for effective functioning. Voluntary attention is the willful act of directing one's mental effort in order to "resist the attractions of more potent stimuli," or "discriminate a sensation amidst a mass of other sensations" (James, 1890, p. 416). Without it, humans would be constantly overwhelmed by a constant barrage of ever-changing outside stimuli (Cimprich, 1992; Johnson & Proctor, 2004). Further, James (1892) noted that a person could divide his or her attention between either sensorial objects (stimuli in the external environment) or intellectual objects (internal stimuli; ideas or memories). Either object may compete for attention. When the person is distracted from a salient goal or task by irrelevant sensorial or intellectual stimuli, the mind is perceived to have "wandered." The ability to be selective enables a person to focus on a single object or process in a given environment and thereby prevent the mind from wandering. When discerning specific stimulus patterns from among a myriad is essential to goal achievement, a person may have to apply mental effort to ignore attractive but irrelevant stimuli and attend to relevant ones (Kaplan, 2001; Posner & Snyder, 1975; Schwartz, Ivancich, & Kaplan, 1997; Theeuwes, 1991).

The Consequences of Voluntary Attentional Fatigue

The attentional capacity required to block out distractions is a limited resource (Posner & Snyder, 1975). Focused and demanding exercise of voluntary attention results in reduced ability to maintain focused attention (Herzog et al., 1997). This results in what has been termed both "attentional fatigue" and "mental fatigue." Attentional fatigue

can produce impatience, frustration intolerance (Herzog et al., 1997; Kuo & Sullivan, 2001), high distractibility (Kaplan, 1995a; Parasuraman, 1998), and erroneous information processing (Meijman, 1997). Attentional fatigue leaves the individual less capable of dealing with uncertainty, confusion, and demanding tasks that are of little intrinsic interest (Chang et al., 2007). Error rates and reaction times increase (Posner & Snyder, 1974). Any and all of these are experienced when attention is fatigued to the point at which college students describe themselves as feeling "fried." A typical example in common parlance of this feeling is captured by Kipfer and Chapman (2010) on American slang "Yeah, I know that fix destroyed the file system, but I was fried when I put it in" (p. 548). Attentional fatigue increases the likelihood of work-related mistakes as well as health and safety-related mistakes such fatigued driving accidents (Brown, 1994; Kenny, 1995).

Involuntary Attention

William James distinguished two varieties of attention based on the amount of mental effort he believed each required. As opposed to the type of attention that is selective and voluntary, he proposed a second type of attention that is passive, reflexive, or *involuntary*. Involuntary attention appears to be a resource not as easily depleted as voluntary, selective attention. According to James (1890), involuntary attention is an effortless response to sensorial or intellectual stimuli of interest. The types of stimuli that elicit a person's involuntary attention are often difficult for a person to ignore (Muller & Rabbit, 1989). He further described such stimuli as generally being instinctively dangerous, novel, or fascinating. Sources of involuntary attention that James (1890)

identified included “strange things, wild animals, bright things, pretty things, metallic things, words, blows, blood, etc.” (p. 417). Support for James’ early descriptions of these types of stimuli have been found in behavioral research in both laboratory and field studies (McArthur, 1981; Taylor & Fiske, 1978; Fan et al., 2002; Jonides, 1981) as well as psychoneural research (Buschman & Miller, 2007; Corbetta & Shulman, 2002; Fan et al., 2005).

Early human survival would have been enhanced by attention to certain patterns, objects, and events salient to safety and/or acquisition of important resources. Certainly, many daily events in the ancestral environment required careful scrutiny (Kaplan, 1978). However, if early humans had displayed only an automatic flight response in the face of every type of potential danger, safety might be guaranteed but occasional opportunities for resource acquisition lost. The ability to assess potentially dangerous situations quickly and with minimal mental effort would have allowed an early human to react advantageously when safety was assured, then possibly reassess the situation, and thereby gain a better understanding of elements of the situation that might result in resource acquisition.

Human survival has always depended more on knowledge than on physical prowess. As a result, attention to situations that afforded informational advantages for survival would have been genetically selected. For example, most carnivores are capable of extended attention toward potential prey that may take hours (a polar bear waiting at a seal breathing hole in the ice) while most lower primates are capable of attention to a food source for ½ hour at the most (Kordlandt, 1965). Humans being highly visual omnivores, attentional flexibility would have been critical in successful navigation of

resource acquisition challenges. Inherent interest in certain stimuli might have made such flexibility more automatic and less effortful. While certain types of environmental and social hazards can evoke a sense of fear and a subsequent avoidance response, mild hazards often attract and sustain a person's interest (Appleton, 1975, 1984; Herzog, 1984).

A sense of fascination with these types of hazards can ultimately promote both surviving and thriving. The emotions evoked may be very different between mild hazards contained at a seemingly safe distance and genuine danger that is immediate and uncontrollable. A mild hazard elicits a pleasurable thrill, while a genuine danger elicits immediate fear (an unpleasant sensation). Interestingly, modern humans still seem to gravitate toward those things that possess a moderate element of danger (Zuckerman, Ulrich, & McLaughlin, 1993).

Fear triggers an avoidance response, as does disgust. The human tendency to remain visually engaged with an object or scene eliciting fascination may therefore be influenced by the emotional valence generated by the stimuli.

Affect

As defined by Panksepp (2000a), emotion is an umbrella term for all of the behavioral, expressive, cognitive, and physiological changes that occur in response to a stimulus, whereas affect is the conscious experience of an emotion.

Some emotions researchers have posited that emotions arise from cognitive processes of appraisal that result in an experienced emotion (affect) and that changes in affect arise from changes in cognitive states. Conversely, somatic theories of emotion claim that bodily responses, rather than judgments, are essential to the elicitation

emotions (Barrett, 2006; Damasio, 1994; James, 1884; LeDoux, 1986). There is robust neurological evidence in support of this stance. These researchers and theorists hold that emotions are an embodied experience that becomes conscious to the mind as an affective change only after the body has first reacted to a stimulus. Further elaboration on antecedent effects to the experience of emotion was proposed by Ekman et al. (1983). They found that in addition to differentiating positive from negative emotions, combinations of autonomic measures (facial expressions) assisted in the differentiation of certain negative emotions (e.g., fear) from others (e.g., anger). During a facial action task, for instance, happiness was characterized by decreased heart rate, anger by increased heart rate and increased skin temperature, and fear by increased heart rate and decreased skin temperature. Based on such findings, Levenson, Ekman, and Friesen (1990) proposed that each discrete emotion is associated with an innate affect program that coordinates changes in the organism's biological states. They further argued that such changes support the behavioral reactions most often associated with particular emotions (e.g., fleeing, in the case of fear).

Regardless of the antecedent cause, affect can apparently influence behaviors, perceptions, and cognitions. Damasio (1996) illustrates this with the statement that emotional response to a stimulus is "a physiological step which will subsequently bias cognitive processes, thus influencing the mode of reasoning and decision making" (p. 206). There are, however, other schools of thought on the sequence of events. Primary appraisal theorists posit that emotion precedes physiology. Affect drives behavior, and negative affect drives behavior the fastest.

The Consequences of Negative Affect

The management of moods, particularly bad ones, is important to college students. Feelings of anger or embarrassment accompanied by high activation have been shown to increase impulsivity, risk taking, and an overall impairment of self-regulatory capacity. States of experienced anger, sadness, frustration, and other unpleasant emotions may lead to a downward spiral. Ergo, the greater the perceived distress, the greater the drain on self-regulatory resources. For personal and social reasons, regulation of the expression of certain mood states is desirable, but costly. Mood regulation requires overriding the current mood and therefore requires inhibition and self-control (Isen,1984; Muraven & Baumeister, 2000). Because people behave very differently when they can control their mood than when they cannot, mood regulation becomes an important life skill (Bratslavsky & Baumeister,1998). Laboratory experiments have shown that people who are dealing with bad moods may be exerting self-control through mood regulation and therefore eventually show signs of self-control depletion (Muraven & Baumeister, 2000). People experiencing a positive mood are likely to adopt accessible goals, while those in a bad mood are likely to reject accessible goals (Fishbach & Labroo, 2007). Baumann & Kuhl (2002) have observed that positive self-representations are less accessible when a person is caught in a bad mood. For instance, perceptions of intelligence needed to instill confidence in challenging school task may be impaired. A disappointing performance may lead to greater negative affect, which then impairs performance even further.

The types of stresses that result in mental fatigue can induce negative affect such as heightened feelings of aggression (Donnerstein & Wilson, 1976) and consequent inappropriate behavior that may lead to social difficulties. Unrelieved stress can also

result in emotional exhaustion. Studies have shown that high levels of emotional exhaustion cause stress and conversely, high levels of stress cause emotional exhaustion (McManus et al., 2002). Again, a negative, downward spiral due to emotional exhaustion, such as that which takes place in the phenomenon of "burnout," may ensue. Burnout impedes performance (Farber 1991; Maslach, 1976; Maslach & Jackson, 1981; Pines & Maslach 1978) as well as threatening the physical and mental health of the student. Burnout represents "the index of the dislocation between what people are and what they have to do, . . . a malady that spreads gradually and continuously over time, putting people into a downward spiral from which it's hard to recover" (Maslach & Leiter, 1997, p. 54). Burnout is a common problem for many college students. For instance, medical student burn-out results in diminished professionalism (Ripp et al., 2011), depersonalization expressed as cynicism, feelings of low personal accomplishment, and a positive correlation with suicidal ideation. So we see that moods can be affected by the demands of student life and conversely, moods can influence academic success. Negative affect can produce a downward academic spiral, while positive affect can assist in a positive upward academic achievement spiral. An understanding of the ways in which mood can be elevated through certain interventions in the learning environment should be of interest to the education community.

The Consequences of Positive Affect

Positive feelings such as joy, pride, contentment, and love expand creativity (Fredrickson & Branigan, 2005; Isen et al., 1987), elevate motivation, and reduce highly risky behaviors (Fredrickson, 1998). Positive affect promotes a broad attentional focus

and global bias rather than a localized, narrow attentional focus (Derryberry & Tucker, 1994). Positive emotions are more likely to promote intrinsically motivated goal attainment. Intrinsic interest in learning has been linked to greater conceptual understanding, higher levels of academic achievement, lower drop-out rates, and greater psychological adjustment (Deci & Ryan, 1991; Renninger, 1992). Positive material seems to be more accessible to people who are feeling good. Fredrickson's (2001) broaden-and-build theory states that positive emotions have the ability to broaden people's momentary thought-action repertoires, and build their enduring personal resources.

Stress Physiology

Physiological stress is also a part of student life. A stress response is a physical reaction to a threat or challenge. It is adaptive and even health promoting in small and infrequent measures. Just as with mental fatigue, routine classroom tasks such as public speaking and math tests can stimulate a physical stress response such as an increase in blood cortisol levels as much as 4-fold above baseline measures (Kirschbaum, Wust & Hellhammer, 1992).

Acute psychological distress first activates the sympathetic adrenal medullary system. The sympathetic nervous system prepares the mind and body for action (Feldman et al., 2004; Herbert & Cohen, 1993; Krantz & Manuck, 1984; Obrist, 1981). In a stressful situation, it does the following:

Increases strength of skeletal muscles
Decreases blood clotting time
Increases heart rate
Increases sugar and fat levels

Reduces intestinal movement
Inhibits tears, digestive secretions
Relaxes the bladder
Dilates pupils
Increases perspiration
Increases mental activity
Inhibits erection/vaginal lubrication
Constricts most blood vessels but dilates those in heart/leg/arm muscles

The main sympathetic neurotransmitter is called noradrenaline, which is released at the nerve endings. The stress response also includes the activity of the adrenal, pituitary, and thyroid glands. One adrenal gland is located on top of each kidney. Adrenaline prepares the body for flight and the noradrenaline prepares the body for fight. They increase both the heart rate, and the pressure at which the blood leaves the heart; they dilate bronchial passages and dilate coronary arteries; skin blood vessels constrict and there is an increase in metabolic rate.

The Physiological Consequences of Responding to Stress

Chronic stress is damaging to mental and physical health. Continuing stress that must be endured has measurable effects on human physiology such as elevated cardio-vascular responses that may ultimately lead to heart disease, stroke, and neuroendocrine responses that lead to a number of health problems. Chronic stress is associated with increased levels of the neuroendrocrine hormone cortisol, which is, in turn, associated with impaired declarative memory, explicit memory, memory retrieval, spatial thinking, and selective attention (Kirschenbaum et al., 1996; Kulhman, Pell, & Wolf, 2005b; Posner & Snyder, 1975). Hippocampal atrophy is associated with chronic stress resulting in learning impairment (just what the college student does not need).

Chronic stress can harm cardiac tissues and suppress the immune system (Sternberg, 2001). Manuck, Kaplan, & Clarkson (1983) and Mathews et al. (2005) found that chronic stress is often a precursor to atheroschlerosis and early coronary calcification. Cortisol, a specific glucocorticoid, along with catecholamines, can cause changes in proliferation, cytokine secretion, antibody production, cellular trafficking, and cytolytic processes in such a way that the body's defenses against influenzas and cancerous agents are suppressed.

Attention Restoration Theory

Attention Restoration Theory (ART) posits that prolonged periods of mental effort can lead to the fatigue of a person's capacity to direct attention with undesirable results (Herzog, Maguire, & Nebel, 2003; Kaplan, 1995a). According to ART, a fatigued person can benefit from interacting with a setting not requiring directed attention. Under such conditions, a person would presumably be able to rest the inhibitory mechanism that underlies the use of that capacity. ART suggests that the rest and recovery of directed attention will occur to the degree that the person-environment interaction allows a person to have a sense of fascination, being away, extent, and compatibility (Kaplan, 2001). Exploring each of those factors in more detail provides a better understanding of the requirements needed for a restorative environment.

"Being away" refers to having a sense of distance from those aspects that are routinely present in one's life, but are generally not preferred. Kaplan and Kaplan (1989) identified three ways that a person could achieve a sense of being away. One way of experiencing such a sensation is to escape from unwanted distractions. Another is to

avoid specific types of mental content that have become routine or mentally taxing. The third and final method that the Kaplans address deals with suspending one's pursuit of certain purposes. The contents of nature, for example, are often in stark contrast to the urban contents (Knopf, 1987). Natural settings tend to offer people relief from those demands that normally occupy the mind, thus enhancing their sense of being away.

Environments that possess "extent" often suggest that the immediate setting is part of a larger whole. Kaplan and Kaplan (1989) have proposed properties that contribute to a setting's sense of extent: connectedness and scope. Connectedness refers to the order and structure of the elements perceived in a given setting (Kaplan & Kaplan, 1982). Scope refers to the scale of the area in which the perceptual and organizational activity takes place (Hartig, Kaiser & Bowler, 1997). Areas that are vast in size can create the sensation of being in a whole other world (Kaplan & Talbot, 1983).

Environments that provide people with distance from their everyday demands, elicit fascination, and that offer a sense of extent can still fail to provide the rest needed to recover a person's attentional resources. For a setting to be truly restorative, a person's inclinations and purposes need to be congruent with the requirements or demands imposed by that setting (Kaplan & Kaplan, 1989). The correspondence between what an individual wants to do, must do, and is able to do in a setting will determine if that setting is compatible. The degree to which a setting is compatible has a direct effect on human functioning.

While all of these attributes of restorative settings are important, the element of fascination was the primary concern of this study. Fascination begins the process and is arguably what sustains it.

Fascination

Fascination is a setting or object's ability to grab and hold a person's attention in an effortless way. The greater the saliency of the stimuli to human interests, such as quick analysis of whether or not approach or avoidance behaviors are warranted, the greater the intensity of the fascination. It is a form of interest. James (1890) proposed that the interest produced by a stimulus could be either *Immediate* or *Derived*. An *Immediate* stimulus is one that is inherently interesting to a person. For example, the sudden sound of an automobile horn can command a person's interest involuntarily but absolutely. In contrast, a *Derived* stimulus is one in which the interest produced is the result of another immediately interesting thing. For example, exposure to one member of a class of objects that provided a positive experience in the past, such as a pleasant afternoon in a state or national park, might predispose the visitor to pay increased attention to advertisements about other park venues and events. Such interest would not be prompted by alarm, but by positively valenced associations. James (1890) not only explored the extent to which interest caused attention, but also the role that effort had in the processes of attention.

The cognitive mechanisms through which the phenomenon of fascination occurs is a matter of some debate. Kaplan (1995) has suggested that all experiences of fascination, from those that are modestly engaging to those that are dramatically riveting, are a bottom-up cognitive phenomenon generally driven by the limbic system. Others argue that fascinating pleasant scenes such as deer grazing, horses cantering, and swans gliding, invoke a more top-down approach. Functional magnetic resonance imaging (fMRI) support for this has been found in the absence of the activation of the amygdala in

participants viewing pleasing natural scenes as opposed to urban environments (Kim et al., 2010). Additionally, Lane et al. (1999) found that the amygdala was activated in scenes eliciting high arousal, but not in scenes of low arousal or pleasant emotional valence. The prefrontal cortex seems to be primarily responsible for the visual processing of what Kaplan might categorize as modestly fascinating, whereas dramatic fascination is a response to a highly arousing stimulus. Much more research on the neurological processes that are associated with self-reports of fascination, affect, and arousal is needed before the top-down versus bottom-up only debate can be resolved. It does appear, however, that an experience of fascination with any stimuli can involve attentional resources, emotional resources, and physiological arousal.

Current research indicates that three processes are involved in voluntary attention to a stimulus that results in psychic effort. The first is the initial state of arousal resulting from input; a second controls the preparatory activation of response mechanisms; and a third operates to coordinate arousal and activation, an operation that demands effort (Pribram & McGuinnes, 1975). This is the cycle of depletion that occurs during the exercise of voluntary attention. Involuntary attention appears to operate through multiple processes as well. Attention that is involuntarily gripped through fascination may derive from two different fascination perceptions: either hard or soft.

Hard Fascination

Fascination that involves dangerous or revolting (rather than the novel and/or pleasing) images or settings is quite effortless and easily falls under James' description of *Immediate* stimuli. This is supported by the work of Mineka and Ohman (2002) and

others (Hygge & Ohman, 1978; McNally, 1987; Ohman, 1986). Fearful images of nature that are immediately threatening or disgusting are quite fascinating (acquisition is immediate and extinction is slower than nonthreatening images), but also highly arousing in a distressing manner that derives from the more limbic portions of the brain. For instance, research on monkeys has found that even unconditioned fear responses to snakes stimulate the amygdala (Kawashima et al., 1999). It can reasonably be surmised that the fascination elicited by this particular form of involuntary attention involves heightened reactivity of portions of the brain responsible for the appraisal of potential threat and physical mobilization of defensive resources. Although quite necessary for survival, such arousal is seldom pleasurable. Thus, it is unlikely to be restorative and may deplete the person's attentional, affective, and inhibitory capacities even further. In short, it fails to offer a content that is conducive to extended engagement and consequent mood elevation. This type of fascination, termed "hard" fascination by Kaplan et al. (2002) involves the immediate attention orienting function in preparation for the fight/flight/freeze behaviors required for immediate safety. For instance, from an evolutionary perspective, fear and panic—like most of our emotions—should be viewed as adaptive responses (Nesse, 1990). Too little fear could lead to maladaptive risk taking while too much fear might incapacitate a person, resulting in paralyzing phobias.

Hard Fascination Experienced as Phobias

Human fears and phobias have three salient categories (1) the types of fears and phobias; (2) the age of onset of fears; and (3) precipitating events (Carey, 2003). A phobia is an intense fear that the person cognitively realizes is too extreme for the

situation but cannot avoid feeling. Phobias usually lead to avoidance of the object or situation. Phobias can lead to phobic disorder in which the person suffers from some personal or social incapacitation because of the phobia. The first salient aspect of these stimuli is that they are not generalizable to noxious stimuli with which individuals have had unpleasant experiences (such as electric shock). Surveys about the types of stimuli that humans fear have been very consistent (Ohman & Mineka, 2001). The majority of fears and phobias involves spatial stimuli (heights, enclosed places), specific animals (snakes, bats, spiders, rats), and social threat (public speaking). Psycho-Evolutionary theory holds that unlike modern threats (guns, electrical outlets), sharks, spiders, snakes, cliffs, and exclusion from the tribe have been threats for thousands of years (Seligman, 1971). It would be maladaptive, especially for vulnerable children, to fail to fear these very real threats to personal survival. The ancestral environment was often full of such threats and they were often hidden. Constant vigilance needed to be the rule. Sometimes, however, appropriate response to evolutionarily dictated threats becomes exaggerated within certain individuals.

Whether it is normal “hard” fascination or abnormal “hard” fascination, we have seen the toll that such vigilance and its concomitant stress takes on the human body and mind. Hard fascination provides the immediate attention orienting function of fight/flight/freeze fascination needed for immediate safety. It is unlikely to be restorative. However, there is another type of fascination that involves less need for mobilization of immediate survival behaviors.

Soft Fascination

A second theoretical type of fascination has been termed "soft" fascination (Berto et al., 2008; Herzog et al., 1997; S. Kaplan, 1995a). Soft fascination appears to require a combination of optimal arousal, interest, and positive affect. By leaving room for cognitive processing of a different sort, soft fascination with a natural scene or setting may restore fatigued attention. Some form of fascination that involves optimal, rather than elevated, arousal and positive affect are far more likely to offer depleted personal resources a needed respite. Ruff and Rothbart (1996) concur with this conclusion. It has been postulated to be a product of a compelling but inherently safe stimuli (Herzog & Rector, 2009; Korpela et al., 2001) such as watching tiger cubs play to the extent that time slips away unnoticed and irrelevant, as opposed to "hard" fascination with threatening stimuli (mother tiger makes eye contact and charges, time seems to slow down but becomes highly relevant). Compatibility with one's personal goals is important in the experience of soft fascination. Watching cubs play is an amusing and uplifting activity that most people find pleasing. One walks away feeling better for having had the experience. Being eaten by the mother tiger terminally interferes with one's goals. In both cases there is a certain interest elicited, one including low arousal and pleasurable affect, one involving high arousal and negative affect. The first instance of fascination has been posited to be restorative, whereas the second one may exacerbate depleted attentional, emotional, and physical resources even further. If true, it may be that soft fascination offers long-term benefits through termed "tireless scrutiny" (Shepard, 1993, p. 278), a type of low arousal, pleasurable viewing of animals where such viewing may

have enhanced human survival through cognitive, emotional, and physiological restoration.

Nature as a Restorative Setting

Thoreau's (1854) account at Walden Pond gives eloquent voice to the influence that nature has on human well-being. Similar works extol nature's rejuvenation of a person's mind, body, and soul (Eiseley, 1957; Leopold, 1949). Eminent landscape architect and designer of New York City's Central Park, Frederick Law Olmsted (1865) strongly believed that the fatigued urban dweller could recover their capacity to focus in the context of nature. Concerning time spent in nature, Olmsted (1865) wrote, "it employs the mind without fatigue and yet exercises it; tranquilizes it and yet enlivens it: and thus, through the influence of the mind over the body, gives the effect of refreshing rest and reinvigoration to the whole system" (p. 22).

Viewing natural scenes, or elements of natural scenes such as wildlife, has been shown to elevate mood, reduce physiological stress response, and restore depleted voluntary attention. For instance, researchers examining changes in affect in light of Psycho-Evolutionary theory have reported reductions of negative affect such as feelings of anger and aggression and an increase in overall positive affect such as perceived happiness, friendliness, or elation after viewing natural versus urban scenes (Hartig et al., 1991; Hartig et al., 1996; Hartig et al., 1997). Additional studies have confirmed that certain features of a viewed environment such as moderate complexity, vegetation, and water consistently lead to positive emotional affect (Fredrickson & Levenson, 1988; Lohr et al., 1996). Support for physiological stress reduction benefits of nature was found by

Hartig et al. (2003) in blood pressure reduction in groups walking in natural as opposed to urban settings. They reported that the nature group "relaxed," i.e., returned to their resting rate, more quickly than the urban group. Other research has provided support for the hypothesis that interactions with nature improve attention and memory (Berto, 2005; Cimprich, 1992, 1993; Cimprich & Ronis, 2003). When exposed to laboratory attention fatiguing tasks such as a digit span backward test or Attention Network Task, Berman et al. (2008) found that walking in nature improved test performance (as opposed to fatigued participants asked to walk in an urban setting) and reported that executive attention was restored when natural scenes were viewed in the laboratory as opposed to urban images. Executive attention is the psychoneural component of directed attention that is subject to depletion through fatigue. In addition to increased test performance, the natural scenes were reported as being more refreshing than the urban scenes. Fascination with natural scenes was attributed as instrumental in beginning the process of attention restoration.

Animals as a Fascinating Component of Nature

Animal fascination may be defined as the animal's ability to grab and hold a person's attention in an effortless way. A hint of this is given by William James (1892), who gave such examples as "strange things, moving things, *wild animals*..." as objects that capture the attention of all humans (p. 417). The Kaplans (1989, 2001) have noted that certain types of animals hold attention, or are fascinating, more than others, such as snakes, bears, wolves, large animals, and the young of many species. They may do so through different types of fascination. It seems unlikely that the same mental process that

rivets one's eyes on a lurking tiger is the same process that promotes continuing visual engagement with two frolicking tiger cubs (viewed in a way that ensures safety from the mother tiger). Some researchers have proposed that human beings have genetic predispositions to attend to the form and movement of *certain* animals differently than to others. If so, this may involve a certain amount of biologically prepared learning (Ulrich, 1993) which provides an immediate template upon which to base survival responses.

Animals are a fascinating component of many natural scenes. As biologist E. O. Wilson (2005) says, "We're not just afraid of predators, we're transfixed by them, prone to weave stories and fables and chatter endlessly about them because fascination creates preparedness and preparedness, survival. In a deeply tribal sense we love our monsters" (p. 13). That humans are fascinated with animals is apparent in many aspects of daily life, from the overwhelming success of television shows such as Animal Planet, to participation by 87 million Americans in wildlife-based recreation and expenditures of over 35 billion dollars in wildlife viewing activities (USFWS, 2006). Fascination with animals is currently of interest to natural resource recreation professionals, zoo and museum exhibit designers, and educators (Bierlein, 2003; Birney, 1990).

The importance of the phenomenon of animal fascination spans several disciplines, such as medicine and tourism. Fascination with animals may produce important and beneficial physiological changes in humans under stress (Ulrich, 1983; Ulrich, Dimberg, & Driver, 1991). Studies have shown that watching animals attenuates physiological stress responses (Katcher et al., 1983; Serpell, 1991). Research specific to cortisol shows that interacting with therapy animals lowers cortisol levels in as little as 5 minutes (Barker et al., 2005). It appears as though interaction with non-threatening

animals provides opportunities to engage in nurturing behaviors that decrease stress physiology responses such as blood pressure and cortisol (Allen, Blascovich, & Mendes, 2002; Allen, Shykoff & Izzo, 2001; Barker et al., 2005; Eddy, 1995; Friedmann et al., 1983).

Arousal and Relaxation

The role of arousal in the process of restoration is unknown. It appears that high arousal is linked to fascination that is non-restorative, while low arousal is associated with fascination that leads to replenishment of an exhausted resource. The Kaplans often imply that an optimal state of arousal is restorative of depleted attentional resources. Such a state is not understood to be one of high physiological arousal, such as fascination with the outcome of a bull-fight. Stimulating scenes that elevate adreno-cortical levels may be pleasurable in the excitement they offer, but are thought not to be restorative. As stated by Kaplan (2002)

> Fascination can come from *content*, and that content can be of various kinds. It can be noisy, like watching auto racing, or quiet, like walking in a natural setting. Fascination can also come from *process.* Recognizing despite uncertainty and difficulty, like bird-watching, is an example of a process that allows one to pay attention without effort…I will refer to such opportunities for reducing directed attention fatigue as "restorative experiences" or "restorative environments" (p. 5).

Embedded in Kaplan's choice of activity exemplars is a certain level of arousal.

Certain animals might have provided a respite from the hyper-vigilance often necessary to daily survival in the ancestral environment. "Hawks drawing lazy patterns in the sunlit air signaled that all was well: the sudden squawking flight of birds in a dark, lowering sky threatened peril. In this way, the calm, friendly, animal presence became associated with safety and induced relaxation in humans" (Melson, 2001; p. 130). In this

passage, Melson suggests the idea that watching animals permits the hyper-vigilance of the ancestral human to rest for a bit. The animals being viewed become defacto sentries, allowing the watcher to relax. Instead of the need to deeply, accurately, and unendingly assess the environment for threats, the human observing the "calm, friendly" animal could reduce chronic levels of arousal that were cognitively and physiologically unsustainable. When the animals themselves pose no threat and are apparently themselves unthreatened, freeze, fight, or flight energy can be rested for a time, allowing thoughts and feelings of broader scope and abstraction to emerge, as well as allowing the survival-based responses to rest and replenish. From tense alert to signs of danger, a return to a state of normalcy could begin. Therefore, it seems likely that viewing certain nonharmful (calm, friendly) animals begins a relaxation response.

The relaxation response occurs when perceived need for heightened arousal and vigilance is deemed no longer necessary, and autonomic nervous system functioning returns to normal. During this response, the body moves from a state of physiological arousal, including increased heart rate and blood pressure, slowed digestive functioning, decreased blood flow to the extremities, increased release of hormones like cortisol, and to a state of physiological relaxation, where blood pressure, heart rate, digestive functioning, and hormonal levels return to their normal state. Relaxation can therefore be defined as a process of return to normalcy from a state of preparation for fight/flight or freeze response.

It may be that arousal level plays a critical role in whether fascination is either hard or soft and likewise whether or not it is restorative or survival response-inducing. For instance, although there may be moments of bird spotting that might qualify as

thrilling with a high level of attendant arousal, most bird-watching is reported as being satisfying, fulfilling, and *relaxing*. Watching auto-racing and bull-fighting is generally considered fascinating and thrilling, but not relaxing. Therefore, it may be that a restorative experience is one in which fascination begins the process, but relaxation must follow such that the restorative environment can be employed for restoration of fatigued directed attention, mood elevation, and physiological stress response reduction. The sympathetic nervous system is activated by any stimulus exceeding an individual's inherent threshold including feelings, noise, and light. Sympathetic activity is catabolic – it breaks down substances in the body to produce energy for activity. Parasympathetic activity is anabolic – it builds up and restores. This rebuilding phase is vital to the maintenance of long-term health. In optimal psychological and environmental conditions the body swings into parasympathetic mode to repair and maintain health. Essentially, the parasympathetic nervous system conserves energy levels. It increases bodily secretions such as tears, gastric acids, mucus, and saliva that help to defend the inner body and promote digestion. The actions of the parasympathetic system are components of the relaxation response. In the ancestral environment, therefore, an expeditious return to a state of normalcy through the agency of the parasympathetic system was a necessary for long-term survival as the fight/flight/freeze responses.

Conclusion

Research examining whether or not restoration of attention, mood repair, and stress reduction are affected by fascination with nature as embodied in differing types of animals, and whether the effects of fascination on these variables is mediated by some

critical process such as relaxation, has not been done. A deep understanding of what constitutes soft vs. hard fascination with nature in general and animals in particular, and when such fascination promotes beneficial health outcomes, should be important to medical, therapeutic, and educational practitioners and theoreticians.

Therefore, the purpose of this study was three-fold: to verify differences in fascination type; to examine variations in relaxation response between fascination types; and to examine certain beneficial cognitive, physiological, and affect changes associated with differing types of fascination as mediated through relaxation, as illustrated in Figure 1. Systematic variation in fascination associated with different animals was designed into the study treatment conditions.

Hypotheses

Where the mediating path turned out to be nonsignificant, the direct paths were tested in light of the following hypotheses:

$H_{1:}$ Response times will be shorter and error rates will be lower in the soft fascination condition than in the hard fascination condition.

H_2: Mean scores on stress reduction will be higher for participants exposed to animal images eliciting a sense of soft fascination than participants exposed to animal images eliciting a sense of hard fascination.

$H_{3:}$ Mean scores on mood repair will be higher for participants exposed to animal images eliciting a sense of soft fascination than participants exposed to animal images eliciting a sense of hard fascination.

CHAPTER 3

METHODS

The purpose of this study was a) to verify differences in fascination type; b) to examine variations in relaxation response between fascination types; and c) to examine certain beneficial cognitive, physiological, and affect changes associated with differing types of fascination as mediated through relaxation. To accomplish this, the following experimental procedures were employed.

Data Collection

Eighty-six participants drawn from the University of Utah student body were randomly assigned to 2 condition groups of 43 each. Ages ranged from 18 to 50, with the greatest percentage of participants being in their sophomore year of college and engaged in a wide variety of academic majors. Approximately 33 % of the participants were majoring in psychology. Participant recruitment was accomplished through the Department of Psychology's Human Subjects Pool. To assist in the recruitment process, a brief description of the experiment was posted online through the Department of Psychology's website. Students who registered through the Department of Psychology's secure, online website participated in the study. No students were excluded from

participating because of gender, age, or other factors. All participants filled out a consent form prior to their involvement in the study (see Appendix A).

Setting

Data collection was conducted on the University of Utah campus in the Department of Psychology's Cognitive Science Laboratory. Each participant was tested in a small laboratory room with one computer that accessed the cognitive measurement programs and the treatments. Lighting was moderate and outside noises were kept to a minimum by closing room doors.

Stimuli

Participants were randomly assigned to one of two experimental conditions. These conditions consisted of viewing animal images theoretically determined to elicit either hard or soft fascination. Images used for the study consisted of photographs of animals collected from public domain sites on the Internet. One condition (soft fascination) consisted of images of animals that were passively posed and commonly considered nonthreatening through both actions and species membership. The other condition (hard fascination) was comprised of images of animals that are considered fear- or disgust-eliciting through both action and species membership. For example, Condition 1 included a series of images of herbivorous wildlife in nonthreatening poses whereas Condition 2 consisted of a series of images of snakes, spiders, insects, and large, carnivorous wildlife species in threatening, active poses.

Vetting

The results obtained from pre-experiment vetting provided a means by which to norm a set of images perceived to be either hard or soft fascination. Results appeared in the form of assignment to one of two groups for each image by 4 volunteers. One image in the hard fascination group appeared miscategorized, resulting in the exclusion of that image. None were excluded from the soft fascination condition. The remaining collection of hard and soft fascination images (89 and 90, respectively) was vetted by an expert in Attention Restoration Theory for assessment that the images were theoretically congruent as well as being absent of any potential nuisance variables. The number of images was then reduced to 70 in each category.

Measurement

The psychometric instruments used to measure the dependent variables included questionnaire items (mood), cognitive performance tasks (attention restoration), and a visual analog scale of perceived relaxation for the mediating variable. Physiological measurement was accomplished through salivary cortisol collection (stress reduction).

Manipulation Check – Fascination

For a manipulation check of the independent variable, three items modified from present tense into past tense language from the ANFASC scale were used (a 5-point Likert type scale from “greatly disagree” (1) to “greatly agree” (5). An additional item was included to elicit scores on desired tactile interaction to the animals viewed intended to determine correlations between proximity comfort and the hard and soft conditions.

The ANFASC is a psychometric instrument intended to measure fascination with

animals created by the author of this dissertation. It has been pilot tested with 106 participants. A series of montages intended to separate various animal types according to theoretical determination of their level of fascination were used for testing of this instrument. For the items and their performance, see Appendix B. Several items used as a criterion scale in the ANFASC measurement study from the Pet Relationship Scale (PRS) were used in this study to identify attitudes toward animals that may correlate with scores on hard and soft fascination. For items from this scale, see Appendix B.

Dependent Variables

Mood Repair

For perceptions of change in affect, a modified Positive and Negative Affect Scale (Feldman-Barrett & Russell, 1998) was used. For the assessment of the dependent variable mood, participants were asked to score their current mood following the manipulation on a scale from 1-5, with 1 = very slightly or not at all, 2 = a little, 3 = moderately, 4 = quite a bit, 5 = extremely.

Certain items were chosen for compilation of two scales derived from the PANAS results (for a list of PANAS items, see Appendix B). These items were determined through factor analysis for groupings that suggested low arousal with high positive affect (LAHP) and high arousal with high negative affect (HAHN).

For the LAHP Scale, the items were Happy, Calm, Relaxed, Content, At Ease, Still. Cronbach's alpha for this scale was .810. This alpha was achieved after elimination of an additional item that loaded with this group ('hyperactivation') but for which scale analysis indicated that the alpha would increase if item deleted.

For the HAHN Scale, the items were Scared, Troubled, Afraid, Nervous, Distressed, Hostile, Upset. The Cronbach's alpha for this scale is .896. This was the factor loading group for this criterion with no items deleted.

Attention Restoration

For assessment of the dependent variable attention restoration, the ANT (Attention Networking Test), a cognitively challenging, attention fatiguing task was used. The ANT is a combination of a flanker task (Eriksen & Eriksen, 1974) and a cued reaction time task (Posner, 1980). Participants indicate the direction of a central arrow that is flanked by four arrows (two per side) pointing in the same direction as the central arrow (congruent condition) or in the opposite direction (incongruent condition); in the neutral condition, either straight lines flank the central arrow or the central arrow is presented alone, depending on the study. As a speed task, the ANT provides two measures of performance, response time (RT) and error rate (ER). Demands on executive attention are elicited by the incongruent flanker condition (Fan et al., 2002).

Stress Reduction

For the assessment of dependent variable stress reduction, participants in each group provided saliva samples for posttreatment cortisol measurement. The saliva was collected in a Salivette® test tube (Sarstedt, Rommelsdorf, Numbrecht, Germany) equipped with an insert containing a sterile cotton-wool swab through which the saliva passes during centrifugation, yielding a saliva free from particles. The swabs were permeated with saliva for 2 minutes, with participants being instructed to place the swab under the tongue and rest passively during that time. Swabs were then placed within the

insert and labeled with the participant's identification number. Three shipments of samples at approximately 8-week intervals were sent to Dr. Clemens Kirschbaum in Germany for analysis at the Biopsychology Laboratory at TU Dresden. Double assay of all samples were performed and the results returned to the researcher within 3 weeks.

Mediating Variable - Relaxation Response

For the assessment of the mediating variable the VAS (Visual Analog Scale by Thaut & Davis, 1993) for perceived relaxation, a mark on a 13.5 centimeter line was requested. For an example of this scale, see Appendix C.

Demographics

Certain personological variables have been shown to inform interest in and attitudes toward animals, such as gender and the personality dimension of "sensitivity" (Cattell et al., 1970; Mathews & Herzog, 1997). This may influence degree of fascination with the images presented as well as affecting the dependent variables. For this reason, information on gender, education level, and age were requested.

Phobias

Participants displaying animal phobias that might skew the means in directions not representative of the sample were identified using items from the Disgust Scale and the FSSC-II scale (fearfulness). For disgust-related animal phobias, three items from the Disgust Scale (Haidt et al., 1994) were used. The scores on the Disgust Scale were

ambiguous and analysis of the scale yielded an alpha of only .57; therefore, this scale will not be used to identify phobia-related outliers. This scale may be viewed in Appendix C.

For non-disgust-related fears, five modified items from the FSSC-II were used (Gullone & King, 1992). Items for both of these scales can be viewed in Appendix B. Of these five items, two were retained after reliability analysis. These two items were ratings on fear of sharks and fear of tigers (Cronbach's alpha = .81). The full list of items is available in Appendix C.

Research Design

A between-subjects 1 X 2 design was used to test the hypotheses. The manipulated variable was fascination. The sample size was 86, consisting of a convenience sample randomly assigned to 1 of 2 fascination conditions (either hard or soft).

In order to validate the study's fascination conditions, an expert in Attention Restoration Theory vetted 180 selected images previously divided into theoretically determined hard or soft fascination categories (with the intention of assembling approximately 67 remaining images in each group). Once the images had been vetted and certain photographs eliminated due to confusing or confounding elements in the image, a random sample of 15 images from each treatment was randomly assembled into a collage for the purpose of presenting a Q-sort task to naive raters. These 30 images were presented to four raters. These raters were provided with definitions of hard and soft fascination as defined in this study and then judged the selected images based upon their understanding of the construct. Based upon unanimous agreement on one image

(rated as soft when the intent of the investigator was that it be considered hard), this image was removed. The final experimental treatments were compiled and saved to DVD for retrieval on laboratory computers. The final product in each case was a series of hard and soft fascination images offered in a continuous 10-minute display to participants, with images changing smoothly at 9-second intervals.

Before viewing the conditions, certain attentional, physiological, and mood conditions needed to be created. In order to instill negative affect and increase stress levels, both condition groups were given 2 minutes to mentally prepare a 2-minute verbal rebuttal to a false accusation of plagiarism (a total of 4 minutes of social evaluation stressing). Following this, both groups were given a 12-minute Simon task (a flanker type attentional task), followed by the ANT (Attention Networking Test), for 17 minutes. These tasks totaled approximately 33 minutes of stressors. According to Balodis et al. (2010), 20 minutes poststressor is all that is generally required for cortisol to be measurable using salivary sampling methods; therefore, time spent on task was deemed adequate for the purpose of establishing a stress baseline.

Following this, participants viewed one of the two experimental conditions. At the conclusion of the viewing sessions, all participants rested in front of a blank screen for 5 minutes while filling out, using paper and pencil, the manipulation check items, the PANAS items, and the Thaut and Davis (1993) Visual Analog Scale for perceived relaxation. Then, all participants were asked to perform a second ANT task for 12 minutes. When prompted by the ANT program to take a break, participants were instructed to do so for 2 minutes. During this time, the salivary cortisol sample was administered and collected. They were then instructed to resume the ANT program for

the third and final session and the response time and error rates for that session were automatically recorded. Following this, a second portion of the questionnaire that included the eight fear/phobia items, PRS items, and demographics information was administered. The entire length of this experiment ran approximately 85 minutes, as illustrated in Figure 2.

Treatment of Data

Data were entered into SPSS 20 PC and cleaned. The presence of missing values, nonsensical values, and outliers were explored. Missing values were imputed through series means calculations. The rationale for this was based on electronic errors with the ANT for 2 participants and data collection problems, with portions of 2 questionnaires going missing following data collection. Because these errors were artifacts of method, and not deliberate omissions by participants, it was decided that imputing means was acceptable. One participant was excluded in their entirety for a second experimental session for which he erroneously

1. Greeting, Participant Consent Form - 2 minutes
2. Speech Task – 4 minutes
3. Simon Task – 12 minutes
4. ANT – 17 minutes
5. Treatment (Hard or Soft Fascination) – 10 minutes
6. Questionnaire 1 – 4-5 minutes
7. ANT – 12 minutes
8. Salivary cortisol sample – 2 minutes
9. ANT – 5 minutes
10. Questionnaire 2 – 4 minutes
11. Debriefing – 1-2 minutes

Figure 2 - Experimental Timeline

registered. The results from the first session were included in the study, while results from the second session where excluded.

Data Analysis

Descriptive statistics on select demographic variables (age, sex, year in school, respondent's exposure to and attitudes toward certain types of animals, and history of animal-related activities) describe the sample. Descriptive statistics were calculated for between-groups differences in levels of attention restoration (as measured by response time and error rates), differences between groups in salivary cortisol results in nano-mols, and scores on differences in perceptions of relaxation and mood repair. Analysis of personological variables was performed to identify participants with animal phobias whose responses may have skewed the results. Mediation analysis was performed. Testing for mediation is a four-step process that involves a series of regression equations (Baron & Kenny, 1986; Kenny, Kashy, & Bolger, 1998).

> Step 1: Show that the initial variable is correlated with the outcome variables. Use Y as the criterion variable in a regression equation and X as a predictor (estimate and test path c). This step establishes that there is an effect that may be mediated.
>
> Step 2: Show that the initial variable is correlated with the mediator. Use M as the criterion variable in the regression equation and X as a predictor (estimate and test path a). This step essentially involves treating the mediator as if it were an outcome variable.
>
> Step 3: Show that the mediator affects the outcome variables. Use Y as the criterion variable in a regression equation and X and M as predictors (estimate and test path b). The mediator and the outcomes may be correlated because they are both caused by the initial variable X. Thus, the initial variable must be controlled in establishing the effect of the mediator on the outcomes.
>
> Step 4: To establish that M completely mediates the X-Y relationship, the effect of X on Y controlling for M (path c') should be zero. The effects in both Steps 3 and 4 are estimated in the same equation (Kenny, 2009).

To summarize. The first regression equation establishes whether there is an effect to mediate. Concurrent steps determine the strength of the mediation effect (complete or partial). When the relation between the predictor and the outcome variable is completely zero, when controlling for the mediating variable, then data are consistent with a complete mediation model. If the relation between the predictor and the outcome variable is significantly smaller when the mediator is included in the model (Path c′), than when it is not (Path c), the data are consistent with partial mediation. This analysis type is displayed in Figure 3.

Threats to Making Valid Inferences

Within any study, there is possibility that any inferences drawn may be invalid due to causes other than the variable or variables studied. Tables 1, 2, and 3 present the potential threats to making valid inferences from this study, how those potential threats were controlled for, and their explanation.

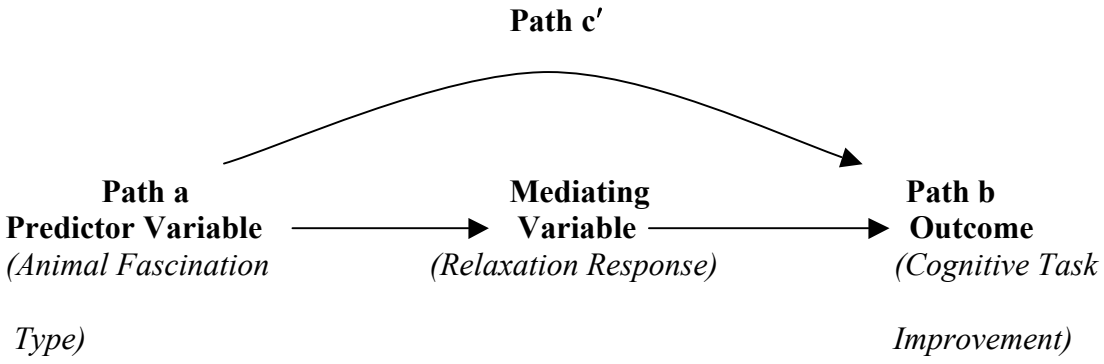

Figure 3.

Mediation Analysis Model

Table 1

Threats to Internal Validity

Threat	Controlled	Explanation
History	Yes	Events within each experimental phase were consistent cross all groups.
Maturation	Yes	Due to the short duration of each experimental phase, maturation was not anticipated.
Testing	No	The ANT was used twice; therefore, some learning effect may influence the RT and ER for the second sessions.
Instrumentation	Partially	The measurement tools utilized for each experimental phase have consistently produced results from which
Statistical Regression	Yes	Focus was on group differences.
Selection bias	Yes	Participants were randomly assigned to experimental groups.
Attrition	Yes	Due to the short duration of each experimental phase, attrition is not anticipated.
Diffusion of treatment	Yes	Participants performed tasks independent of other participants. Furthermore, interactions between participants during lab sessions were kept to a minimum.

Table 2.

Threats to External Validity

Threat	Controlled	Explanation
Generality across subjects	Yes	Random Assignment
Generality across settings	Partially	Only natural scenes containing wildlife were used for the study.
Generality across response	Unknown.	Unknown.
Generality across time	Partially	Participation in the proposed study occurred on different days, but at limited times of the day.
Generality across behavior change agents	Yes	Images were systematically selected and vetted based on visual attributes related to fascination.
Reactive experimental arrangements	No	Participants willingly volunteered to participate in the study.
Reactive assessment	Partially	Participants did not know which parts of their performance were being evaluated.
Pretest sensitization	No	A pretest was administered and recorded for the ANT
Multiple-treatment interference	Yes	Participants participated in only one of the two conditions.

Table 3.

Threats to Statistical Conclusions

Threat	Controlled	Explanation
Low statistical power	No	Limited sample available
Violation of assumptions	Partially	Statistical assumptions were assessed.
Unreliability of measures	Partially	Reliability of measures was assessed. Pre-test
Consistency of treatment	Partially	Each experimenter underwent extensive training.
Random irrelevancies in the experimental setting	Partially	Experimenter noted irrelevancies when possible.
Random heterogeneity of subjects	Yes	Subjects were randomly assigned.

CHAPTER 4

RESULTS

The purpose of this study was three-fold: to verify differences in fascination type; to examine variations in relaxation response between fascination types; and to examine certain beneficial cognitive, physiological, and affect changes associated with differing types of fascination as mediated through relaxation. Systematic variation in fascination associated with different animals was designed into the study treatment conditions. This chapter provides a summary of the results of data analysis for this study, including hypothesis testing.

Descriptives for Sample

The sample was comprised of 86 participants from the Psychology Human Subjects Pool. The samples consisted of 29 males and 56 females. The average age was 22, with the minimum being 18 and the maximum being 50. Education level reported in years of schooling completed ranged from freshman (12) to (18) for master's students.

There is evidence in the literature (Herzog et al., 1991) that gender differences can have strong influence on attitudes toward animals, and since this study uses animals as a representation of manipulated aspects of the independent variable fascination, this

was the person-level attribute of most interest to this study, the results of which can be seen in Table 4.

Cronbach's alphas for the scales used were the following: Anfasc1=.84; PetAtt =.87. The items for these scales can be viewed in Appendix B. Anfasc1 is a scale comprised of Animal Fascination items 1-3. Item four (Q4) was reverse coded and intended to vary inversely from items 1-3, hence the reporting of that animal fascination item means separately (nonsignificant). Neither the Anfasc1, nor Animal Attitude Item 6 (Q6), were significant. However, gender differences were significant for the Pet Attitude scale and Question 7 of the Animal Attitudes items (strong believer in animal rights).

Descriptives for Variables and Scales

After performing the affective and cognitive stressors, the treatment was applied for 10 minutes. Participants were then asked to complete a questionnaire that began with relaxation measurement, a 4-item animal fascination measure and a 39-item mood measure. The analysis of those results involved examining the arithmetic means and

Table 4

Attitudes Toward Animals by Gender (*SD* in parentheses)

Gender	Anfasc1 Scale	Anfasc Q4	PetAtt Scale	Anm Att Q6	Anm Att Q7
Females	3.23 (.90)	2.61 (1.63)	3.61 (.92)*	2.70 (1.28)	4.55 (.76)*
Males	3.11 (.99)	2.82 (1.61)	3.08 (1.20)*	2.70 (1.15)	3.75 (1.18)*

*$p<.05$

standard deviations for each image through rank order. With the exception of the attentional measures, all data in this study were non-normally distributed. Statistical description of differences in means and the distributions of the treatment data are included in Table 5.

The hard and soft fascination means listed in Table 5 were derived by formulation of a fascination scale comprised of scores on perceived fascination using three positively worded items and a fourth item that was reverse coded, rated on a 5-point scale. These items are available in Appendix C. The results of the ANOVA on the animal fascination scale are listed in Table 6.

Table 5

Mean Fascination Rating for Each Condition (*N*=82)

Condition Type	Mean	*SE*	Skewness	Kurtosis
Hard (*n* = 43)	3.55	.101	-.756	.105
Soft (*n* = 39)	2.97	.120	-.351	-.043

Table 6

Summary of ANOVA Results: Hard and Soft Fascination

	Df	MS	*F*	ρ
Between Treatments	1	14.007	16.768	<.000

R^2 = .175 Observed Power=.981 Cronbach's alpha for the above scale was .81.

This manipulation check was significant at $p<.000$, supporting the premise that there was indeed a difference in perceptions of hard and soft fascination, and that such perceptions were elicited by the images presented. In this case, the scene content was images of threatening or disgusting animals (hard) versus images of harmless and appealing animals (soft). Therefore, for purposes of this study, an assumption of the efficacy of the hard and soft fascination manipulation was assumed.

This analysis being performed, the next step was to examine scores on the PANAS, which were intended to be divisible into affective groupings indicating that mood had either been repaired to a measurable extent, or had remained negative (or perhaps worsened). Affect was measured using two scales constructed for the purpose of this study: one scale composed of items that captured components of low arousal and high positive affect (LAHP), and another that captured components of high arousal and high negative affect (HAHN). These scales were constructed using PANAS items suggested by Crawford and Henry (2004). Factor analysis narrowed this list of items to those used in the two scales derived for this study. The Cronbach's alphas for the resulting scales (LAHP and HAHN) respectively were .813 and .885. The Crawford and Henry positive affect scale displayed a Cronbach's alpha of .88, so the reliability of the scales created was assumed to be adequate. The items chosen for the scales can be viewed in Appendix C. The descriptives of the data are listed in Table 7. Following examination of the mood measures, scores on relaxation were examined. The results are in Table 8.

Table 7

Descriptive Data Analysis for Mood Repair Measures

Condition	Mood Scale	Mean	*SD*	Skewness	Kurtosis
Soft (*n*=42)	LAHP	3.13	.775	-.611	-.389
Hard (*n*=43)		2.92	.768	-.496	-.618
Soft (*n*=42)	HAHN	1.38	.615	2.28	5.75
Hard (*n*=43)		1.56	.748	1.71	2.67

LAHP = Low arousal and high positive affect

HAHN = High arousal and high negative affect

Table 8

Descriptive Data Analysis for Relaxation Measure

Variable	Mean	*SD*	Skewness	Kurtosis
Relaxation (*n*=83)	9.24	2.77	-.790	-.119

Salivary cortisol samples were sent to the Dresden University Biopsychology Lab in three separate batches, 2-3 months apart, with the first shipment being sent at the end of April and the third shipment being sent at the end of October. The second shipping in late August was sent with cold packs; the other two were not. In between shippings, samples were stored in a small refrigerator in the Cognitive Psychology Lab at 51^{o} F. The compiled data from the three groups of samples are listed in Table 9.

Table 9

Descriptive Data for Salivary Cortisol Measure (nmols)

Variable	Mean	*SD*	Skewness	Kurtosis
Cortisol (*n*=79)	20.48	24.41	4.22	23.095

The evaluation of the attentional effect occurred through a series of 2 (condition type: hard and soft fascination) x 3 (three attentional types) analyses of variance (ANOVA) on participants' performance on the Attention Networking Task. Examination of the attentional variables required retrieval of the participant's responses from performance of the ANT in the form of E-Prime files. These files were then reduced to the elements of interest, converted to Excel files, cleaned, and converted to SPSS 20 files. The results of this portion of the experiment, both pretreatment and posttreatment, are listed in Tables 10 and 11. Analysis of between-groups accuracy on the ANT was also performed. No significance was yielded.

Hypothesis Testing

The data collected from this study provide a way to gain greater understanding of the benefits that theory suggests should accrue to persons exposed visually to certain types of natural stimuli. It has been hypothesized that such benefits might accrue to person's emotional, physical, and attentional resources. Where an effect was determined to exist, mediation analysis was performed to identify and quantify any indirect effects

Table 10

Descriptive Data Analysis for the Attention Networking Task Session 1

Variable	Mean	*SD*	Skewness	Kurtosis	*SE*
FlankerType					
Incongruent	561.83	206.69	.308	3.68	
Congruent	456.18	161.78	-2.54	10.34	
Neutral	454.35	158.37	-2.85	11.85	
WarningType					
No Cue	527.72	124.92	-2.47	10.12	
Center	493.99	118.68	-2.37	9.33	
Spatial	532.01	104.96	-.944	7.72	

Table 11

Descriptive Data Analysis for the Attention Networking Task Session 2

Variable	Mean	*SD*	Skewness	Kurtosis	*SE*
FlankerType					
Incongruent	551.12	181.31	-2.35		2.04
Congruent	454.98	152.76	-2.24		1.72
Neutral	455.12	150.71	-2.49		1.70
WarningType					
No Cue	595.01	107.01	-2.00		11.89
Center	566.74	103.24	-1.80		11.47
Spatial	520.78	104.17	-.916		11.57

presented by the variable relaxation. The criterion of significance, unless noted otherwise, was .05.

To test Hypothesis 3, based in Attention Restoration Theory, the Attention Network Test (ANT; Fan et al.., 2002, 2005; the ANT version from Jin Fan's Web site: http://www.sacklerinstitute.org/users/jin.fan/) was employed. This task identifies three different attentional functions: alerting, orienting, and executive attention. These different functions are dissociable both behaviorally (i.e., Fan et al., 2002) and neurally (Fan et al., 2005).

Theoretically, viewing softly fascinating nature should improve executive functioning, but not alerting and orienting types of attention, because these latter two functions require less cognitive control compared to executive functions. The ANT uses an incongruent flanker condition for the assessment of executive attention functioning. Although flanker conditions assessing alerting and orienting attention are reported, it is the incongruent condition that is of most interest in this study. For scores on the ANT, aggregated scores served as the unit of analysis (observations were $n = 189$). Three participant's scores were not included, due to responses in excess of five standard deviations for hard fascination scores, resulting in a highly negatively skewed distribution for hard fascination. Results of the analysis of pre- and posttreatment scores and between subjects scores are listed in Table 12.

Analysis of Variance on measures of executive attention between treatment groups indicated no significance difference in response times that would indicate an improvement in the attention variable of most interest in this study, executive attention

Table 12

Pre-and Posttreatment Attention Scores (*N*=41 for each condition)

Attention Type	*Hard Fascination Viewing*		*Soft Fascination Viewing*	
	Before	After	Before	After
Executive	71(6.3/43)	95(10.0/45)	76(5.0/32)	104(8.0/51)
Orienting	38(4.6/30.0)	56(6.2/40.0)	38(3.9/25.0)	38(7.0/44.8)
Alerting	36(4.4/30.0)	27(7.0/47.0)	33(4.20/28)	28(4.45/29)

Unit of measurement = milliseconds
SE and SD in parentheses

functioning. Neither was an effect found for alerting or orienting attention. In fact, except for alerting attention, response times were slower posttreatment for both executive and orienting attention, indicating that fatigue was induced, but apparently not ameliorated by the soft fascination condition, as theory suggests it should have been. The results of the ANOVA performed for the attention measures can be seen in the Table 13.

The ANOVA results do not provide support for the hypothesis that directed attention, an executive function, is restored by exposure to scenes theoretically determined to be high in soft fascination elements.

Measurement of posttreatment cortisol was significant, as Table 14 indicates. However, with examination of the observed power, it seems reasonable to conclude that with more samples stronger effects may be observed.

Although the direct path between Condition and Cortisol is significant, the effect is very weak. Examination of β values indicates that if any mediation of the effect is

Table 13

ANOVA for Response Times Between-Groups for the ANT Posttreatment

Attention	*SS*	*df*	*F*	*p*
Executive	1636.12	1	.712	.401
Orienting	6045.32	1	3.36	.070
Alerting	4.39	1	.003	.957

p<.05

Table 14

Summary of Correlation Results of Salivary Cortisol (nmols)

Variable	*r*	*r2*	*1-tailed t-test*	*β*
Cortisol (*N*=79)	-.193	.032	. .045*	.193

* $p < .05$
Observed power=.398

present, it is less than 10 %, and therefore relaxation is not influential enough to be considered further as a mediator between these variables. The results of the ANOVA performed on z-scores for the two mood scales are listed below in Table 15. The final step in determining the effects between these variables was to examine relaxation scores between groups. The results are in Table 16. Since Tables 15 and 16 show that there is evidence of an effect for both mood and relaxation, a mediational analysis to determine the influence of relaxation on mood changes generated by hard and soft fascination conditions was performed.

Table 15

Summary of ANOVA Results for Mood Repair

Variable	*SS*	*df*	*MS*	*F*	*p*
LAHP (N=42)	4.53	1	8.50	8.90	.004**
HAHN (N=43)	1.71	1	1.71	5.09	.027*

* $p < .05$ ** $p < .01$
LAHP R^2*=.097 Observed power=.838*
HAHN R^2*=.058 Observed power=.607*

Table 16

Summary of ANOVA Results for Relaxation

Variable	*SS*	*df*	*F*	*p*
Relaxation(*n*=82)	38.14	1	5.284	.024*

* $p < .05$
R^2*=.062*
Observed power=.622

Following Kenny et al. (1998), a series of regression equations were run in order to test for mediation. The first equation regressed the outcome variable (LAHP) on the predictor variable (Condition) to determine if there was an effect to mediate. As predicted, the standardized regression coefficient ($b = .306$) associated with the effect of condition on mood repair (Path c′) was significant ($p < .01$). Having met the first requirement for mediation, a second regression equation assessed the effect of condition on relaxation. The standardized regression coefficient ($\beta = .249$) associated with this relationship was also significant ($p < .05$), satisfying the second requirement for

mediation. To test whether the relation between fascination type and affect is mediated by relaxation, LAHP was regressed simultaneously on both fascination type and relaxation. The resulting coefficients were (Cond β = .205; Relaxation β = .397). Although the path of that relationship was not 0, but rather .05, the model is not representative of full mediation. The third regression equation provided an estimate of the relationship between fascination type and mood repair, when controlling for relaxation (Path a+b). Table 17 contains each of the analyses utilized to establish mediation.

It can be seen that relaxation does partially mediate the effect of fascination upon affect enhancement, contributing about 67% of the explained variance. Similar procedures were conducted for HAHN, with the results also indicating partial mediation at approximately 60%. Table 18 presents a summary of the results from hypothesis

Table 17

Testing for Mediation through Multiple Regression

Testing Steps in Mediation Model	B	β	*SE*
Testing Step 1 (Path c)			
Outcome: LAHP			
Predictor: Fascination Condition	.446	.306**	.152
Testing Step 2 (Path a)			
Outcome: Relaxation			
Predictor: Fascination Cond	1.366	.249*	.594
Testing Step 3 (Path b and c′)			
Outcome: LAHP			
Mediator: Relaxation	.107	.397*	.027
Outcome: HAHN			
Mediator: Relaxation	.107	.397*	.027
Predictor: Fascination Condition	.303	.205*	.150
Outcome: HAHN			
Mediator: Relaxation	-.111	-.510*	.020
Predictor: Fascination Condition	-.217	.-183	.112

* p<.05 ** p < .01

Table 18

Summary of Hypothesis Test Results

Hypotheses	Result
H_1 Mean scores on stress reduction as measured by salivary cortisol will be higher for participants exposed to animal images eliciting a sense of soft fascination than participants exposed to animal images eliciting a sense of hard fascination.	Null Rejected
H_2 Mean scores on mood repair will be higher for participants exposed to animal images eliciting a sense of soft fascination than participants exposed to animal images eliciting a sense of hard fascination.	Null Rejected
H_3 Mean scores on a directed attention performance task will be lower for participants exposed to animal images eliciting a sense of soft fascination than participants exposed to animal images eliciting a sense of hard fascination.	Null Accepted
H_4 Relaxation response will mediate the effects of fascination type on the dependent variables.	Null Rejected

testing. The results obtained from the various analyses suggest that, within the study, images of animals perceived as being high in soft fascination offered participants certain mood related benefits. Tests for mediation established that the effect of fascination type (hard vs. soft) on mood repair was substantially, yet not fully, mediated by differences in perceived levels of relaxation. Support for the benefit of soft fascination on executive attentional capacity was not found. Although support was discovered for the benefits of soft fascination on physiological stress as measured through salivary cortisol, weak effect size, and low power indicates that greater strength of sampling size might very well yield increased and unambiguous support.

CHAPTER 5

DISCUSSION

The purpose of this study was to examine the potential for beneficial health outcomes that visual interaction with natural scenes and objects, theoretically determined to contain elements of soft fascination, might have for college students. Such benefits accrued might be on an attentional, emotional, and/or physiological level. The two theories sourced in this study indicate that as many as three types of beneficial health outcomes might ensue from visual interaction with softly fascinating animals.

Attention Restoration Theory

Support for the importance of soft fascination in restoring executive attention was not discovered in this study. According to Attention Restoration Theory, recovery from directed attention fatigue is contingent upon a person being able to periodically rest his/her directed attention capacity (S. Kaplan, 1995a). Directed attention greatly relies on executive functioning of attentional capacities. Without question, certain types of settings are more effective than others at facilitating the restoration of fatigued directed

attention through refreshment of executive attentional capacity. Previous studies have centered on this premise by comparing the restorative effects of urban and natural settings. For many people, natural settings serve as a source of rest and escape, whereas urban settings appear to do little to refresh fatigued directed attention and may indeed exacerbate such fatigue. Natural settings appear to be interesting in a fashion that elicits sense of soft fascination and facilitates the restoration of executive attention functioning (S. Kaplan, 1995a). All natural settings, however, are not equal.

The present study proceeded with the expectation that animal images perceived as being high in soft fascination would offer similar executive attention advantages under the rubric of Attention Restoration Theory to pastoral landscape scenes, as well as offering benefits in mood repair and stress reduction under the rubric of Psycho-Evolutionary Theory. The hypotheses that touch on ART are based on the premise that soft fascination images will evoke a form of attention that is effortless, yet low in arousal, leaving room for other forms of attention to manifest while directed attention rests. The hypotheses that touch on Psycho-Evolutionary Theory are based on the premise that viewing nonthreatening nature is biologically prepared in humans to offer beneficial health outcomes of stress reduction and mood repair. It was hypothesized by the investigator in this study that all such beneficial outcomes would be mediated through relaxation.

Interpretation of Results – Attention Restoration

A natural scene that a person perceives as softly fascinating is efficacious in the restoration of positive affective states and optimal physiological states. Exposure to

pleasing natural scenes, in the form of harmless and attractive wildlife, does appear to offer emotional and physiological benefits. Certain of these processes do appear to be mediated by a relaxation response. However, executive attention restoration in this study did not occur. There may be theoretically sound reasons why, in this experiment, executive attention was not restored.

Attention Restoration researchers have asserted that fascination is required as a first step in the restoration process. It has been posited that this response to a stimulus is necessary to entrain an effortless form of attention, enabling a person to begin the process of resting directed attention. Fascination with visual representations of natural scenes and the elements of natural scenes (water, animals) is thought to begin the process of restoration where the initial human-environment interface is visual. For instance, eye movements are one way to measure attention when viewing a scene. Research on differences in eye movements suggests that less effort is required to view natural than urban scenes (Berto, Massaccesi, & Pasini, 2008). Eye saccades are more abundant in unnatural, unpleasant, or urban scenes, indicating that the mind is harder at work than with views of softly fascinating scenes. However, the present study indicates that for directed (executive) attention restoration, soft fascination alone may be insufficient, since perceptions of soft fascination where elicited, yet produced no attentional benefits. The images chosen for the manipulations used in this study appeared to perform in ways consonant with fascination as posited by Attention Restoration Theory. Present in the images were animals selected for their general membership in categories of sublime (hard fascination), disgusting (hard fascination), or pastoral (soft fascination). The softly fascinating images were consistently rated as such by the participants as revealed by the

manipulation measure, yet still did not yield attentional benefits. Perhaps this lends support to the importance of other attention restoration constructs of being away, extent, and compatibility (Kaplan, 1995a). These together characterize the fullness of the critical elements central to Attention Restoration Theory. A recent work by Kaplan and Berman (2010) demonstrated beneficial attentional results gained from viewing softly fascinating images of nature (versus urban scenes) consistent with ART, yet the results of this study do not support soft fascination *alone* as restoration of executive attention. On the surface, this is somewhat surprising, as might be deduced from the ART literature such as this quote from Berman and Kaplan (2010).

> Natural environments, such as parks, gardens, and lakefronts, are able to capture involuntary attention without monopolizing attentional channel capacity. At the same time, the requirements to direct attention are minimized. It is therefore hypothesized that after an interaction with natural environments, one is able to perform better on tasks that depend on directed attention abilities. (p. 7)

The actual landscapes the animals were situated in were visually minimized, to eliminate confounding variables in the form of distracting landscape elements. Perhaps profile and close-up images of animals outside of a landscape context do not offer the same attentional advantages as scenes with broader scope.

In this experiment, a sense of being away was almost completely unavailable. Although top-down (soft) and bottom-up (hard) processes were well represented by the stimuli, opportunities for a sense of being away, as well as extent, and compatibility, were largely absent. An explanation for the importance of the presence of the other three dimensions is offered by Berman and Kaplan (2010) who go on to suggest:

> …although ART derives from James's distinction between voluntary and involuntary attention, it also acknowledges a number of complications that call for a subtler theoretical formulation. First, the presence of automatic, effortless attention holding stimuli (fascination) that softly attracts attention is very

> likely not the only factor that must be present for restoration to take place. ART posits three additional factors that contribute to restoration. (p. 8)

Therefore, they seem to hold that even though soft fascination is critical for the process inception, all four dimensions of attention restoration theoretical parameters must be present for restoration to occur. In the case of this study, elicitation of a sense of being away, a distancing of oneself from daily concerns and unwanted distractions, was not engineered into the design, for theoretically driven reasons. Escape from unwanted distraction deliberately being controlled for, no opportunity to engage this dimension was presented. Suspension of goals for a time may or may not have occurred, since students were definitely interrupting daily activities to participate in the experiment, and yet may have perceived this activity as a typical and required student experience. Indeed, participation in the experiment assisted students in achieving the long-term goal of graduation, and therefore perceptions that this was a welcome and voluntary departure from goal pursuits might well have been attenuated. In a natural (nonlaboratory) setting, fascination with an animal and its form and/or behavior in context might entice the observer to switch attentional tasks for a spell, resulting thereby in suspension of immediate goals and purposes. In addition to probable absence of a sense of being away, the lack of complexity and extent in the scenes presented may have hindered attention restoration. Although forms were present, behaviors and landscapes were not, which may have weakened the restorative effects of the soft fascination condition on executive attention.

Psycho-Evolutionary Theory

Although there appeared to be no measurable improvement in executive attention as measured by the ANT, other health benefits were detected. These benefits are consonant with Psycho-Evolutionary Theory. Therefore, interpretation of the results might be profitably viewed through the lenses of consideration of the psychological and physiological elements of human evolution, particularly adaptations to stressful conditions in the ancestral environment. One such consideration might be that beneficial effects appeared to accrue to processes governed by the parasympathetic system. Cortisol reduction, relaxation response, and mood improvement are all governed by the "rest and digest/feed and breed" aspects of the human body's environmental response circuitry. Just as hard fascination scenes contain inherently aversive, generally displeasing content that ramps up the sympathetic system, an argument might be made that exposure to scenes of soft fascination is inherently pleasurable, and that such pleasure signals an opportunity for de-escalation of hypervigilance and a return to (or maintainence of) repose (Ulrich et al., 1991). If true, a reasonable question to ask is which came first, the mood improvement or the stress reduction. Stress reduction will be examined first.

Social threats in the ancestral environment might result in harm, death, abandonment, banishment, and resultant failure to reproduce. Social threats might therefore be considered to be just as serious as environmental threats, and just as stress inducing. For the purpose of inducing stress in this experiment, participants were exposed to a social stressor (speech task) for the first 4 minutes of the experiment. There is recent evidence to suggest that threats to the social self (social value, esteem, status,

self-worth, etc.) can generate a robust glucocorticoid response (Dickerson & Kemeny, 2004). Further, it has been shown that cortisol can influence emotion through stimulation of neurons in brain regions thought to underlie emotional responses. It seems likely, therefore, that the speech task generated sufficient stress to cause cortisol blood levels to begin to rise. Immediately following this task, they were asked to perform attentional challenge tasks for approximately 29 minutes. This was intended as a means of maintaining cortisol levels initially elevated by the speech task. According to Kirschbaum and Hellhammer (1989) and others, acute stressor induced cortisol peaks between 20 and 30 minutes after stress induction. This placed the blood cortisol spike at maximum at the beginning of each treatment. The treatment itself was 10 minutes in duration, followed by 4 minutes of questionnaire responses and 12 minutes the ANT. This means that reductions in blood cortisol had both already occurred (or not) and had ample time to enter the salivary glands.

Somatic marker hypothesis advocates would conclude that the reduction in cortisol began immediately during the soft fascination condition and was already in effect by the time that participants completed their mood measure, thus influencing their perceptions of their affect. Indeed, assuming that a reduction in stress began with the first few images, cortisol levels would have been in descent immediately upon viewing the first 1-2 minutes of slides. Such a descent would need to be somehow perceived by the participant's parasympathetic system within 10 minutes (the length of the treatment) after which time they were asked to immediately respond to relaxation and mood items.

Research by Kreutz et al. (2004) indicates that circulating blood cortisol can indeed influence emotional states within that time. Further, Henckens et al. (2012) found

that heightened levels of cortisol increase emotional interference during an aversive words task. Also, Ellenbogen et al. (2002) found that participants exhibited less emotional interference with an attention task when favoring positive stimuli over a neutral condition. In both studies, the effects of affect on attention were apparent in under 15 minutes. So there is certainly some evidence that the body cues the mood, which may in turn cue attentional functioning. Some animal studies suggest that behaviors as complex as risk assessment can be modulated by corticosterone within minutes (Mikics et al., 2005). Therefore, it seems likely that potential effects of cortisol on human emotions may manifest within minutes. However, in the ancestral environment, minutes may not have been quick enough (Nesse, 1990). If hormones take minutes to engage the emotions, which are only then are employed to engage behavior, the tiger may win.

When Berman et al. (2008) applied affect measures in their study of restorative scenes and environments, they did not find that mood changes were significant between nature scenes and urban scenes, nor did they expect to. Ironically, however, their participants "rated viewing pictures of nature as significantly more refreshing…and more enjoyable…than pictures of urban areas" (p. 1210). Also "liking" ratings of the nature pictures were greater than those of the urban pictures. They too used the PANAS as their affect measure, yet without finding significance, which supports ART, which holds that mood repair is not relevant to restoration of directed attention. Indeed, there is support in the literature that mood improvement may truncate cognitive performance. For instance, Kaplan and Berman (2010) state:

> … it is important to note that these interventions (forming implementation intentions and improving mood) may not actually restore cognitive abilities, but

> may instead raise participants' pain thresholds to continue performing arduous cognitive tasks, even though continuing is quite uncomfortable. (p. 1212)

It would thus be unwise to advocate mood repair as a means of facilitating executive functioning. Tice et al. (2007) found that mood improvement consistently resulted in task persistence. There would have been times in the ancestral environment when the ability to break from a task that involved positive affect was adaptive. Appropriate and timely task switching was almost certainly critical to survival, as illustrated by the following quoted from (2010) Kaplan…." Just as wild ungulates cheerfully consuming a patch of delicious foliage look up intermittently (reducing the likelihood that anything could sneak up on them), being too preoccupied to scan for potential hazards would also have been dangerous for our ancestors"(p. 4). Concerning mood and stress, different yet complimentary theories that might hold illumination for the results of this study, such as primary appraisal theory (what the grazing ungulate of mention is engaged in).

More consonant with PET, Stemmler (2004) and others have reasoned that emotions have distinct goals and therefore require differentiated autonomic activity for body protection and behavior preparation. Autonomic activity prepares the body for action before any behavior has been initiated. This is reflective of Brener's (1987) notion of preparation for energy mobilization. The role of emotions in this mobilization is a matter of some debate, as is the role of cortisol in primary appraisal processes. Current emerging technologies may assist in clarification of certain aspects of the debate. For instance, recent fMRI research has demonstrated that certain brain regions, thought to transmit emotional information to the amygdala in a coarse but efficient manner, are suppressed in the presence of elevated cortisol levels (Sudheimer, 2009). Smyth et al.

(1997) demonstrated that acute daily stressors were associated with lower positive affect and higher negative affect and that negative affect was associated with higher cortisol levels and positive affect was associated with lower cortisol levels. Further, and perhaps more interesting, daily stressors were not significant predictors of cortisol secretion when affect was controlled. Irritation, tenseness, and tiredness were associated with elevated cortisol levels for in-line workers on "bad" workdays as opposed to workdays reported as "good" or "normal" days (Lundberg et al., 1989).

In this study, cortisol was significantly positively correlated with low arousal and positive affect (r=.286, p=.010) and nearly significantly negatively correlated with high arousal and negative affect (r.=-.130, p=.126). However, the strength of the relations was weak. Therefore, for purposes of understanding the results of this study and for informing theory, it might be useful to consider the emotions generated through viewing of hard and soft fascination images as the primary triggers that informed the participant's self-report of mood. This has implications for the primacy of emotion in stress reduction for Psycho-Evolutionary Theory. This said, an open mind concerning the influence of cortisol on self-reported emotional states would also be prudent, especially when considering other variables such as relaxation (or its absence).

Relaxation has been well researched as a means for mood repair in combination with other mood management techniques (Thayer et al., 1994). Understanding the importance of relaxation in the context of this study has implications for both ART and Psycho-Evolutionary Theory. Relaxation that occurs either through cognitive manipulation of sympathetic peripheral systems or through techniques such as bio-

feedback has been shown to be an effective way of reducing stress and improving mood. Relaxation training has been shown to decrease cortisol and ameliorate negative moods in HIV positive men, both short-term and post-10-week intervention baseline measures (Cruess et al., 1999). The results of the current study lend support to the idea that a daily dose of soft fascination with nature facilitates relaxation, stress reduction, and mood improvement. Relaxation is obviously critical for student performance in a number of venues. When recreational and leisure activities encompass soft fascination opportunities that lead to relaxation, health benefits may be achieved. In nature, hard fascination images of the sublime may be awe inspiring, but likely not relaxing.

Psycho-Evolutionary Theory Interpretation of Results

The results of this study inform and are informed by Psycho-Evolutionary Theory, in that "tireless scrutiny" must have been somehow rewarding cognitively (through information acquisition), emotionally (a pleasing aesthetic experience), and physiologically (stress reduction and relaxation). In this study, HAHN was negatively correlated with relaxation at $p<.000$, strong inverse relation. It seems likely then that further research may show that stress reduction and mood repair are indeed critically mediated by relaxation.

Study Limitations

While this study was able to obtain initial evidence in support of the beneficial effects that scenes containing elements of soft fascination have on a person's capacity for mood dependent self-regulation, relaxation, and stress reduction, there are certain study

limitations. The first limitation relates to the ecological validity of the study. Information obtained was the result of participants viewing images in a lab setting, as opposed to the actual environment. Although previous research has shown that the use of digital photographs as surrogates is a valid approach, others have called it into question (S. Kaplan, 2001). Clearly, there are differences that exist between a simulated setting and one that involves interaction with live animals. Nature interactions simulated in a lab setting lack some of the sensorial richness (i.e., touch, smell, etc.) that plays a critical role in defining a person's outdoor experience. Further, proximity is automatically controlled, eliminating the pleasant thrill of loomingness or potential unexpected approach. Tactile interaction is lacking, as are the expression of nurturing behaviors such as feeding on the experience of soft fascination. Experiments involving live animals (and especially wild animals) are needed, particularly in regards to understanding their effect on restoring directed attention.

Another limitation to the present study centers on the issue of sampling. For the purpose of this study, the exclusive use of a single population sample (college students) occurred. The use of this population sample is clearly justified, as many college students are at an increased risk for directed attention fatigue (Tennessen & Cimprich, 1995). Regardless, this study should be regarded as pertaining to the validity of various theoretical propositions, rather than inferential to any population, college student or otherwise. Despite these and other limitations to this study, this experimental approach still offered insights on the role that fascination with animals has as means of eliciting restorative experiences.

Directions for Future Research

Extensions to the present study could proceed in a variety of directions. The most logical track to pursue would involve continued examination of the potential effect that soft fascination might have on restoring a person's executive attention. Although the results obtained in the current study indicated that static images of animals perceived as high in soft fascination did not achieve measurable restoration of executive attention, an increase in the amplitude of the stimuli might be achieved through combining elements. There is evidence gathered in this and other studies to indicate that students can greatly restore mood and reduce stress through interactions with wildlife in a natural setting, a campus setting, or even a classroom setting. Perhaps there are possibilities for attention restoration when a broader scope is presented as well. Studies that pose softly fascinating wildlife in pastoral settings might yield different results for the executive attention benefits, even in a laboratory setting. Additionally, increasing the action involved in the exhibits, either through video or live animal demonstrations, may strengthen the effect of the stimuli on the viewer. Indeed, the dosage achieved through the combining of setting and wildlife content could offer results of theoretical and practical interest to urban, park, and campus planners alike.

Further studies in measurement of cortisol are needed. Personal cortisol levels can vary quite widely within individuals. Pretreatment baseline measures of participant's cortisol levels would be useful in identifying participants whose daily cortisol baselines are abnormally high, such as sufferers of Cushing's disease. Also, some researchers have shown that the link between psychological stress and cortisol is not clear cut. For instance, Weekes et al. (2006) reported that although an examination stress protocol

triggered elevations in both psychological stress measures and cortisol levels in student participants, these elevations were *not* related to one another. Further, Curtis et al. (1978) reported study results in which cortisol secretion was *not* coupled with the subjective feelings of stress, and that subjective feelings of stress do not always translate into high cortisol levels. Thus, high levels of cortisol do not necessarily directly cause subjective feelings of stress or distress; in fact, there is emerging evidence that the reverse may be true. It may be that under certain kinds of threats, rewards, or other stimuli, different parts of the brain engage in different, and sometimes seemingly contradictory, ways. Correlational studies to clarify these links may prove useful in understanding the ways in which fascination may be productively measured under differing protocols. This may help in derivation of data that are more normally distributed than the posttreatment scores yielded by this study.

This study, and the others cited for this work, have all revolved around visual stimuli. Although there are auditory studies that touch on the principles of attention restoration (Salamon et al., 2002), there appears to be a lack of information on restorative natural experiences that blind individuals might enjoy. Although technically outside the purview of this study, it is something that future researchers in this discipline might find worthy of exploration.

Finally, future researchers may wish to further explore the benefits that images of domestic animals may confer. Research outside of the fields of Psycho-Evolutionary Theory and Attention Restoration Theory provides comprehensive support for the notion that certain animals sooth and restore. For instance, Allen et al., (2001) have demonstrated that the presence of a dog lowers blood pressure during execution of

stressful cognitive tasks. Further, the presence of a pet in a classroom has a positive impact on a variety of cognitive and social variables (Hergovich, Monshi, Semmler, & Zieglmayer, 2002). The presence of a pet reduces the blood pressure in children reading aloud (Friedmann et al., 1983). An innovative program called READ (Reading Education Assistance Dogs) showed impressive results; all of the students who participated in the program for 13 months gained at least two grade levels and some of the students gained four grade levels (Jalongo, Astorino, & Bomboy, 2004). Yet the benefits of classroom animals remain controversial for reasons of child and animal health and safety (even the Human Society of America is officially opposed to classroom pets).

Quantitative research that supports the cognitive, educational, and emotional benefits of animals to school children is needed, even if such research begins with static images. This research may also need to incorporate elementary school-age participants, since to date, little has been done with school-age children in the Attention Restoration literature. The presence of animals on college campuses needs further exploration as well.

The emerging field of therapeutic recreation involving animals can be greatly benefitted by this research and additional studies illuminating the benefits that soft fascination with nature in general and with animals in particular. Hippotherapy is an area of therapeutic recreation that is exploding (All et al., 1999), as is the use of dog training for sufferers of PTSD and prison inmates. Programs for inmates (such as Pups Behind Bars and Pups For Prisoners) are particularly in need of quantitative research, to support the overwhelming anecdotal evidence that fascination with domestic animals is therapeutic. Elder care is made easier for patients and caregivers when the facility has

access to visiting therapy animals (Bernstein et al., 2000). Recreation engaged in with pets can help to ameliorate loneliness for socially isolated individuals (Epley et al., 2007). Funding for these types of therapeutic programs is a perennial challenge, and the more scientific support for the benefits of these programs, the greater the likelihood of new or continuing support. Such research is presently conducted by psychology, clinical therapy, geriatric, and nursing disciplines, while Parks, Recreation, and Tourism has been unusually reluctant to explore this topic. The same is true of the soft fascination benefits of zoos and museums, although to a lesser extent. It is hoped that this study and others like it will begin to open avenues previously unregarded.

Concerning the benefits to college students, this study lends support to the idea that animal watching on campus might be health promoting. For instance, Windhager et al. (2011) posit that aquariums in public places possess "…all the key qualities of a restorative environment listed by Kaplan (1995b): fascination (attracting involuntary attention), being away (conceptual rather than physical transformation), extent (rich and coherent enough to constitute a whole other world) and compatibility (no interference with one's goals)."(p.16) To continuously renew attention to an external focus, perhaps due to the movements of the animals, facilitates relaxation and requires no prior training (Friedmann et al., 2000). In contrast to erratic movement and sudden change, movement patterns associated with safety show "heraclitean" motion that is "always changing, but always remaining the same" (Katcher & Wilkins, 1993, p. 176). Fish provide a perfect example of this. In this Viennese study, mall shoppers spent significantly more time gazing at a display window containing a large aquarium, than viewing static displays more typical of malls. They were also twice as likely to return to that same window as to

return to other displays. It seems that in the busy milieu of the shopping mall, these customers were finding something fascinating enough to cause them to pause, and even to return. Although beyond the scope of that study, might we not speculate that the people stopped, stayed, and then returned because fish viewing was doing something good for them? So too might wildlife and animal viewing opportunities do something good for college students in the form of minirestoration, right on campus. Fountains and water features with ornamental fish, aquariums, and aviaries situated in commons might all be features easily incorporated into the campuses of the future. Test designs for such features, followed by thorough data collection on possible benefits, is lacking. Further research in general that helps learning environment designers, park, zoo, museum, and program designers understand the benefits of providing exposure opportunities to the natural world, such as softly fascinating animals, is greatly needed.

Conclusion

The aim of this study was to examine the effect that fascination, mediated by relaxation, had on students' capacity to restore voluntary (executive) attention, engage in mood repair, and experience a reduction in physiological stress and indicated by salivary cortisol levels. To that end, the study obtained results that indicated significant remediation of both physiological stress and negative affect. While the results of the study satisfied certain expectations and contributed to new understandings of restorative experiences, it also provoked new questions. Explanations have been offered in this work, but quantitative support for these speculations is certainly needed. Furthermore, tests for mediation supported the notion that perceptions of relaxation mediated

differences in mood repair, but were not significantly correlated with cortisol reduction, which seems surprising. Nevertheless, taken collectively, the results of the study provide a deeper understanding of soft fascination as restorative, and hard fascination as very nonrestorative, possibly even hindering performance further. Taken as a whole, this work may serve as foundation from which to explain the value that soft fascination with watchable wildlife may have on restoration of mind, body, and heart.

APPENDIX A

PARTICIPANT CONSENT DOCUMENT

Lauren Hall, Ph.D. Candidate, Principal Investigator

Jason Watson, Ph.D., Co-Investigator

The Effect of Fascination Type on Attention Restoration, Mood Repair, and Stress Recovery as Mediated Through Relaxation Response in College Students Viewing Images of Animals

CONSENT DOCUMENT

BACKGROUND

You are being invited to participate in a research study that will examine the psychological effects of viewing images of certain types of wildlife. Please read the brief description before deciding whether to volunteer.

This study involves research about human-animal relations and how those relations affect a person's attentional, emotional, and physiological resources. The purpose of this research is to better understand whether a person may obtain cognitive, affective and physical benefits from viewing certain types of animals. No images of cruelty to, or abuse of, animals will be displayed.

Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether you want to volunteer to take part in this study.

STUDY PROCEDURE

The entire experiment will take place in one session and last approximately an hour. During your involvement in the study, you will be asked to complete a series of tasks that require some thinking and concentration. For example, you may be asked to follow instructions, engage in a cognition task, view a series of images, respond to questions about those images, and complete various paper and pencil activities, and chew gently on a cotton swab for two minutes. The purpose of this swab is a test of salivary cortisol. Salivary cortisol measurement will yield important information to the researchers concerning each participant's level of physical stress. The swab is odorless and tasteless and should not be an uncomfortable experience.

RISKS

The risks of this study are minimal. For example, you may become a fatigued mentally from the length of the study. You may also feel upset or uncomfortable if you find some of the tests difficult and some of the images unpleasant. These risks are similar to the life experiences you might have when you are faced with a challenging task or see certain images on television. There may be other risks, which are currently unforeseeable. If you feel upset from this experience, you can tell the researcher, and he/she will tell you about resources available to help.

BENEFITS

You may receive college credit for your participation in this study, but otherwise there are no direct benefits to you from your participation in this study. This study may provide information to increase scientific understanding about how certain types of animal watching opportunities can affect a person's attentional, affective, and physical resources.

ALTERNATIVE PROCEDURES

If for any reason you do not want to participate in the study, you may do so without any disadvantage to you. For students who do not wish to take part in the lab experiment but would still like to receive research credits for your undergraduate psychology course, as an alternative you may read a published research article which helped form the basis of the hypotheses that will be tested and the manipulations that will be used in the present study.

CONFIDENTIALITY

All of the information that you provide during the course of the study will remain strictly confidential. Specifically, all paperwork and all data will be kept in a locked filing cabinet or on a password protected computer. Only the PI and her research team will have access to this information. For the purpose of this study, each participant will receive an identification (ID) number. That ID number, rather than the participant's name, will be attached to all data collected for the study. Portions of the data collected in this experiment, stripped of any identifying characteristics, may be presented at a conference or published in a scientific journal.

PERSON TO CONTACT

If you have any questions, concerns, or complaints regarding this research study or if you feel you have been harmed as a result of participation, please contact the PI of the study, Lauren Hall Ruddell, at 801-585- 8542 (24 hour voice mail) or by email at lauren.hall@hsc.utah.edu. As well, you may also contact the Co-investigator of the research study, Dr. Jason Watson, at 801-585-7956 (24 hour voice mail), or by email at jason.watson@psych.utah.edu.

Institutional Review Board: Contact the Institutional Review Board (IRB) if you have questions regarding your rights as a research participant. Also, contact the IRB if you have questions, complaints or concerns which you do not feel you can discuss with the investigator. The University of Utah IRB may be reached by phone at (801) 581-3655 or by e-mail at irb@hsc.utah.edu. **Research Participant Advocate:** You may also contact the Research Participant Advocate (RPA) by phone at (801) 581-3803 or by email at participant.advocate@hsc.utah.edu.

VOLUNTARY PARTICIPATION

You may decide whether to participate in this study. If you decide to take part, you will be asked to sign a consent form. You are still free to withdraw at any time without giving a reason. Refusal to participate or withdrawal from the study will involve no penalty or loss of benefits to which you are otherwise entitled. This will not affect your relationship with the investigator.

COSTS AND COMPENSATION TO PARTICIPANTS

You will be compensated with 1-2 hours of research credits for your participation in the study (depending on the actual length of the experiment).

CONSENT

By signing this consent form, I confirm I have read the information in this consent form and have had the opportunity to ask questions. I will be given a signed copy of this consent form. I voluntarily agree to take part in this study.

_____

Printed Name of Participant

_____ _____

Signature of Participant Date

_____

Printed Name of Person Obtaining Consent

_____ _____

Signature of Person Obtaining Consent Date

APPENDIX B

SAMPLE EXHIBITS: HARD AND SOFT FASCINATION

Hard Fascination









Soft Fascination

APPENDIX C

QUESTIONNAIRES

(*Questionnaire, p. 1)*

Participant # _____

Please make a mark on this line indicating your level of relaxation.

Completely Unrelaxed *Completely Relaxed*

I_____I

Please circle the number that best reflects your judgments about the statements below

(1 = strongly disagree; 5 = strongly agree)

1) I found those animals enthralling

   1 2 3 4 5

2) I found those animals riveting

   1 2 3 4 5

3) Those animals completely captured my attention

   1 2 3 4 5

4) I would enjoy petting most of those animals

   1 2 3 4 5

(*Questionnaire 1, p. 2)*

This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way right now . Use the following scale to record your answers:

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

_____ hyperactivated _____ calm

_____ guilty _____ enthusiastic

_____ attentive _____ afraid

_____ tired _____ nervous

_____ sluggish _____ distressed

_____ happy _____ excited

_____determined _____ strong

_____ sleepy _____ hostile

_____ proud	_____ relaxed
_____ alert	_____ jittery
_____ interested	_____ upset
_____ pleased	_____ content
_____ miserable	_____unhappy
_____ ashamed	_____ confident
_____ inspired	_____ at ease
_____ bored	_____ droopy
_____ scared	_____ irritable
_____ dull	_____ drowsy
_____troubled	_____ still
_____quiet	

(Questionnaire 2, p. 1)

Participant #_____

Do you have vision problems that are not corrected by glasses or contacts? Yes No (If yes, please explain below).

_____

Have you ever experienced any of these cognitive tests/stressors before? (Please circle)

Speech task Simon Task Attention Networking Task (ANT)

How fluent are you in the English language? Not very much Somewhat Quite good

Age _____

Highest level of education achieved (high school – 12 years; Bachelors degree = 16 years, etc.) Please circle one or write in an answer.

12 13 14 15 16 17 18 other _____

Gender (please circle one) M F

Pet Ownership (please circle one)

a. I am currently a pet owner. Y N
b. I am not now a pet owner, but I have been in the past. Y N
c. I have never been a pet owner. Y N

If you answered yes to either statement a or b, please answer questions 1-15 below. If you answered yes to statement c, please skip questions 1-5 and proceed to question 6 -15. Please circle the number that best reflects your judgments about the statements.

1. My pet/pets are very important to me.

   1 2 3 4 5

2. I talk to my pet/pets about things that bother me.

   1 2 3 4

3. My pet/pets are very good at making me laugh

   1 2 3 4 5

4. My pet/pets are equals in my family

   1 2 3 4 5

5. In many ways, my pet/pets are the best friends I have

   1 2 3 4 5

6. Domestic animals exist primarily to serve human needs

   1 2 3 4 5

7. I am a strong believer in animal rights

   1 2 3 4 5

Please indicate how much you agree with each of the following statements, or how true it is about you. Please write a number (1-5) to indicate your answer:

1 = Strongly disagree (very untrue about me)

2 = Mildly disagree (somewhat untrue about me)

3 = Neither agree nor disagree

4 = Mildly agree (somewhat true about me)

5 = Strongly agree (very true about me)

8) Seeing a cockroach in someone else's house really bothers me. _____

9) It would bother me to see a rat run across my path in a park. _____

10) I would be extremely disgusted if I walked barefoot on concrete and stepped on an earthworm. _____

Please indicate how much you agree with each of the following statements, or how true it is about you. Please write a number (1-5) to indicate your answer:

1 = Strongly disagree (very untrue about me)

2 = Mildly disagree (somewhat untrue about me)

3 = Neither agree nor disagree

4 = Mildly agree (somewhat true about me)

5 = Strongly agree (very true about me)

11) I am very afraid of spiders _____

12) I am very afraid of sharks. _____

13) I am very afraid of tigers. _____

14) I am very afraid of dogs. _____

15) I am very afraid of snakes. _____

This concludes this experiment. Please give this questionnaire to the researcher and thank you very much for your participation.

APPENDIX D

EXPERIMENTER'S INSTRUCTIONS AND DEBRIEFING FORM

Protocol

1. Greet your participant and take them to the testing room. Give them the consent form and answer any questions they might have. Offer them a copy of the form to take with them.
2. Explain to the participant that is preferable for the test to be completed without interruption, and that it might take 75-85 to complete and that they also need to have clean hands. Escort them to the restroom and then back to the testing room.

3. Begin testing with the following instructions

You have been falsely accused of plagiarism by your professor on a paper you worked hard and were proud of. Please formulate a 2 min speech to the Department chair to (a) tell your side of the story, (b) why the professor is wrong, (c) how they can prove you did not commit plagiarism, (d) specify what should happen to the professor for his or her mistake, and (e) summarize your points.

Set timer next to the computer for 2 minutes. They must compose their defense silently and just in the head, no pencil or paper. When the timer goes off, set it again for

2 minutes and ask them to deliver their speech. They need to speak until the timer goes off again.

4. Place the participant in front of the computer, and access the Simon Task. Orient the key board for the participant so that the Q key on the left side and P key on the right side are evenly positioned in front of the participant. This means the key board will be slightly off toward the right side of the participant. Instruct them to use pointer fingers on the Q and P keys to respond to the task. Instruct them to begin the task and to continue until the program indicates completion.

5. Upon completion, immediately begin them on the ANT. Instruct them to use only the pointer and index fingers of the right hand and that they may position the mouse anywhere they wish as long as it remains to the right of the keyboard. Begin the ANT. Assign the correct subject number for the session at the prompt, and designate it session 1. Advise the participant to take no breaks and to proceed straight through to the end. This will take 17 minutes. ‘

6. At the completion of the task, begin them on the manipulation that is scheduled for that session. A log will be in the room that tells you whether that session is scheduled for the ‘H’ treatment or the ‘S’ treatment. Advise the participant that you will be just outside the door. Also inform them not to touch the mouse during the treatment and that the images will proceed automatically. The videos are

located in the video folder under Nature and Attention on the N drive. Right click the folder (either 'Hard or 'Soft) and choose 'play with VCL. When it starts hit pause and go to the video menu. Make sure that the 'scale' option is marked and then choose the 5:4 aspect ratio option. Set to full screen and allow the participant to select 'Play'. Ask them to inform you verbally without getting up that they are done. After making sure that the images are proceeding on the full screen, leave the room and close the door gently.

7. When they have informed you of completion of the treatment, enter the room and give them Questionnaire 1 (and a pen if needed). This will take each participant 1-2 minutes. Take the questionnaire from them upon completion.
8. Ask the participant to begin the ANT again, including the practice. Inform that that they will need to take a break following completion of the 2nd trial session. Again, designate the ANT session with the correct subject number, and assign this session as session 2. After making sure that they have begun successfully, leave the room briefly to file the questionnaire in a secure location that you will be informed of before testing and retrieve a cortisol swab and tube from the cooler in the main lab office. Be sure to check the tube number and make sure that it matches with the participant number on the questionnaires and the session numbers for the ANT. For instance, Tube 01 goes with participant 01, and ANT Subject 01, sessions 1 and 2.
9. When the participant has completed the ANT practice, and the first two trials and the program prompts them to take a break or continue, tell them to take a 2 minute

break. Have them remove the cortisol swag from the tube and place it under their tongue set the timer for 2 minutes. When the bell rings, have them remove the swab and place it into the tube. Ask them to resume the ANT for the third and final trial. Take the tube and place it into the ziplock bag designated for samples for that week in the cooler.

10. When the participant has completed the ANT. Give them Questionnaire 2. When they have completed that, give them the debriefing form. Escort them from the lab and thank them for their participation. Notify Lauren by email that the session was completed so that credit can be assigned.

DEBRIEFING FORM

The purpose of this study was to …

Examine the effects the viewing different kinds of animals may have on certain beneficial health and cognitive outcomes based upon the type of fascination they offer and whether or not those benefical outcomes are mediated through a relaxation response.

This research is important because …

Knowledge of the role of animals as a component fo restorative scenes and environments helps inform health care providers and restorative environment designers and managers as to the types of fascination needed for the experience the wish to provide, how animals may factor into creating that experience and whether or not a relaxation response to the stimuli is required creating the outcome of the engineered experience.

If would like to learn more about this topic, please refer to the following publications:

Beck, A. M. & Meyers, N. M. (1996). Health enhancement and companion animal ownership. Annual Review of Public Health, 17, 247-257.

Berman, M. G., Jonides, J. & Kaplan, S. (2008). The cognitive benefits of interacting with nature. Psychological Science, 19(12), 1207-1212.

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APPENDIX E

ALTERNATIVE CREDIT ASSIGNMENT

Dear participant,

Please take 10 days or less to read this work. Upon notifying me that you are ready, a short series of questions will be sent. Upon successful completion of answering the questions within 48 hours, credit for 1.5 hours will be issued. Please send your student ID along with the answers to the questions.

Biophilia-Biophobia-landsc~1.PDF (2 MB)

(Ulrich, R. (1993). Biophilia, biophobia, and natural landscapes. In S. R. Kellert, & E. O. Wilson (Eds.), The biophilia hypothesis (pp. 73-137). D.C.: Island Press.)

Question #1

According Orians and Appleton, early human beings developed a preference for

a. Cool deep forests

b. Open savannahs

c. Estuaries and marshes

Question #2

A biophobic response to an animal that may be dangerous is

a. Automatic and rapid

b. Slow and deliberate

c. Unhealthy and maladaptive

Question #3

According to the authors, biophilic and biophobic responses are

a. genetic only, as twin studies prove

b. learned only, as developmental psychology proves

c. a combination of both

d. A matter of personal preference for landscape and animals

Question #4

According to the author, unthreatening landscapes are…

a. conducive to attention restoration and increased creativity

b. pretty boring

c. conducive to mood improvement

d. a & c

e. none of the above

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Appleton, J. (1984). Prospect and refuge re-visited. *Landscape Journal*, 3, 91-103.

Archer, J., & Lamnin, A. (1985). An investigation of personal and academic stressors on college campuses. *Journal of College Student Personnel, 26*, 210-215.

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