THE EFFECTS OF REFLECTIVE PROMPTS ON ATTENTION IN RESTORATIVE AND NON-RESTORATIVE ENVIRONMENTS

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Abstract

Attention Restoration Theory (Kaplan, 1995) posits that the prolonged use of directed attention results in directed attention fatigue and that exposure to environments with restorative properties leads to increased attentional capacities. Despite a great deal of evidence illustrating this effect, there has been little research into the specific mechanisms accounting for this effect, and no research examining what is occurring in the mind during the restorative process. Most researchers have operated on the assumption that the relaxation of directed attention faculties accounts for the effect of attention restoration, with little evidence to completely support this assumption. However, conflicting evidence suggests that similar restorative effects for attention can be achieved by very different methods than attention restoration. Reflection has been conceptualized as a component or side-effect of the restorative process, but no research has examined how or if reflection adds to the effects of attention restoration.

This study examined how reflective processes contribute to the restorative effect of attention restoration. In a randomized 2X3 design, 81 participants drawn from undergraduate university classes were given an attention-draining task, and then exposed to either restorative or non-restorative environments, and given either directed or generic prompts to reflect, or no prompt. Exposure to restorative environments was associated with greater attentional recovery than exposure to non-restorative enviornments. The greatest restoration appeared to occur in conditions with generic prompts to reflect, although this difference was not significant. Directed prompts were found to increase positive affect, and restorative conditions experienced significant decreases in negative affect and perceived arousal. Differential effects were found for the

amount and type of reflection elicited in the conditions, but largely suggested that directed prompts elicited more internally-based feedback while generic prompts tended to elicit more externally-based reflection, and that the prompting reflection led to increases in reflection. These results suggest that reflection may play a greater role in the attention restoration process than previously believed.

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Chapter 1

Overview

Attention Restoration Theory (Kaplan, 1995) states that directed attention is a finite resource that can be exhausted from overuse. The immersion in or viewing of certain environments can lead to a recovery of attentional faculties while other environments do not foster this attentional recovery. Research has demonstrated that certain environments, or, more specifically, certain qualities of the person-environment interaction, have restorative properties that lead to a resting of directed attention (Berto, 2005; Chang, Hammitt, Chen, Machnik, & Su, 2008; Hartig, Evans, Jamner, Davis, & Gärling, 2003; Herzog, Maguire, & Nebel, 2003; Laumann, Gärling, & Stormark, 2001). Exposure to restorative environments has been shown to lead to improved performance on attention-demanding tasks, in comparison to exposure to non-restorative environments (Berman, Jonides, & Kaplan, 2008; Berto, 2005; Chang, et al., 2008; Hartig, et al., 2003; Laumann, Gärling, & Stormark, 2003; Tennessen & Cimprich, 1995). Attention Restoration Theory also posits that natural environments contain more restorative qualities than most other environments (Kaplan & Kaplan, 1989; Kaplan, 1995). Natural environments are most often contrasted with urban, or built, environments, and according to Attention Restoration Theory, urban environments do not contain the restorative properties that are so abundant in natural environments. The directed attention restoration effect can also be

replicated with images of restorative environments, meaning that attention restoration can occur in laboratory settings with images, and that *in vivo* exposure is not a necessary condition for restoration (Berto, 2005; Berto, Massaccesi, & Pasini, 2008; Hartig, Böök, Garvill, Olsson, & Gärling, 1996).

While much research has addressed the validity of Attention Restoration Theory, little has been done to explore the specific mechanism(s) of attention restoration. Some research has indirectly looked at this issue (Herzog, Black, Fountaine, & Knotts, 1997), but no studies seem to directly address what may be accounting for the restorative effect. Attention Restoration Theory states that the resting of directed attention is responsible for the restorative effect (Kaplan & Kaplan, 1989; Kaplan, 1995), and most of the research in the field has proceeded under this assumption. However, contrasting evidence comes from the field of meditation. One of the distinct benefits of various meditation practices is a restoration and enhancement of attention capacities (Chan, 2004; Lutz et al., 2009; MacLean et al., 2010). Most, if not all, types of meditation involve some component of focusing directed attention (Lev, 1995; Lutz, Slagter, Dunne, & Davidson, 2008; Valentine & Sweet, 1999). This is almost the direct opposite of what Attention Restoration theory proposes. However, in terms of attention, meditation achieves remarkably similar results to restorative environments. This suggests that there may be other mechanisms that account for the directed attention recovery effect of restorative environments besides the resting of directed attention.

Many theories and studies on meditation divide meditation into two domains: the regulation and focusing of attention component, and the "open-monitoring" component that is most often associated with mindfulness-based meditation (Anderson, Lau, Segal, & Bishop, 2007; Bishop et al., 2004; Lutz, et al., 2008; Tang et al., 2007). Open-monitoring, commonly

referred to as mindfulness, involves monitoring content in the mind in a non-reactive manner, and is often described as reflective awareness of cognitive and affective content (Bishop et al., 2004). Given that meditation has been shown to increase levels of attention through focusing directed attention (Chan, 2004; Lutz et al., 2009; MacLean et al., 2010), and restorative environments have demonstrated similar effects through resting directed attention (Berman, Jonides, & Kaplan, 2008; Berto, 2005; Chang, et al., 2008; Hartig, et al., 2003; Laumann, Gärling, & Stormark, 2003; Tennessen & Cimprich, 1995), it seems possible that there may be part of the open-monitoring/mindfulness component that is accounting for some of the attentional recovery for these differing processes. Reflection, as conceptualized in the attention restoration literature, shares many of the qualities of the open-monitoring/mindfulness component of mediation. Until now, reflection seems to have been conceptualized in Attention Restoration Theory as a by-product or side-effect of the restoration process (Herzog, et al., 1997), but evidence from the field of meditation suggests that it may in fact be a component of the restorative process.

The literature on learning and education suggests that reflection is an important part of learning and absorbing new material (Davis, 2003). Many studies have demonstrated that prompts to reflect on material during the learning process have been effective at increasing learning (Davis, 2003; Lee, 2010; Wirth, 2009) and making reflective processes explicit (Davis, 2003; Quintana, Zhang, & Krajcik, 2005). There is evidence that different types of prompts, such as specific, guided prompts (directed prompts) or simple, nonspecific prompts (generic prompts) can lead to different results (Davis, 2003). Working on the assumption that reflection is a component of the attentional recovery process of viewing restorative environments, reflective prompts provide a mechanism to operationalize this reflection, as well as allowing for

different levels of reflection to be compared. Comparing reflection across restorative and non-restorative environments is also possible through this design.

This study explored the role of reflection in the attention recovery process of people exposed to restorative and non-restorative environments. Reflection was induced through the use of generic or directed prompts and assessed via instructions to participants to briefly write down thoughts. These instructions either asked the participant to briefly write down whatever thoughts they were having (generic prompts), or to reflect on and write down thoughts about specific topics believed to constitute meaningful reflection (directed prompts). These prompts were given during exposure to either the restorative or non-restorative environments. Replication the results of previous Attention Restoration studies was an important and necessary part of this study, in order to establish the effectiveness of restorative environments and provide the groundwork for manipulation of reflection. Inducing reflection during exposure to restorative and non-restoarive environments allowed for assessment of the degree to which reflection influences the restorative experience. If reflection increases the restorative effect of non-restorative environments, it would suggest that reflection is an important part of attention restoration, and that the resting of directed attention may be only the first step in the restorative process, rather than the only step in the restoratrive process.

GLOSSARY OF TERMS

Some of the information contained in the literature review may not be immediately understandable by the reader. This glossary provides a list of terms with brief explanations in order to facilitate the reader's understanding of the subjects under review.

> *Imagine an individual standing in a nature setting, effortlessly noticing the scene around them, and resting themselves. Now imagine another individual standing at a city intersection, striving to focus on all the stimuli around them. The differences between these two types of settings and the interactions that the individuals will have with them will lead to different experiences. The following literature review and study will examine these types of experiences and the outcomes that result. The following terms will enrich the reader's understanding of the following material.*

Directed Attention	The ability to focus attention. This ability requires sustained concentration and the inhibition of extraneous stimuli.
Directed Attention Fatigue	The diminished ability to direct attention and ward off distractions that results from prolonged use of direct attention.
Restorative Environment	An environment that fosters an attentionally-restorative/refreshing experience (in research, most often a natural environment; e.g. forest, lake setting)
Non-Restorative Environment	An environment that does not foster restorative experiences (in research, most often built environments; e.g. cities, urban settings)
Restorative Properties	The properties on an environment that result in restorative experiences. These are not simply properties of the environment, but of the person- environment interaction.
Meditation	Open-monitoring, commonly referred to as mindfulness, involving monitoring content in the mind in a non-reactive manner, often described as reflective awareness of cognitive and affective content
Reflection	Attending to thoughts and emotions about oneself (different subfields define reflection in varying ways, and while some of these alternative definitions will be discussed, this is the definition that will be used in this study)

Directed Attention Fatigue

Directed Attention is one of the key components of Attention Restoration Theory (Kaplan, 1995). The ability to hone and focus attention has long been considered to be one of the essential, if not the most essential, elements of human functioning (James, 1892). William James originally made the distinction between voluntary and involuntary attention, maintaining that voluntary attention is under conscious, intentional control, and involuntary attention is not under conscious control, but more of a free-roaming attention. These concepts have been extensively investigated (Demeter, Hernandez-Garcia, Sarter, & Lustig, 2010; Kaplan & Berman, 2010; Liu, Abrams, & Carrasco, 2009; Prinzmetal, Zvinyatskovskiy, Gutierrez, & Dilem, 2009). Concepts of voluntary and involuntary attention were further refined by Kaplan in his 1995 paper that proposed Attention Restoration Theory and laid out its foundations (Kaplan, 1995). Kaplan substituted the terms *directed attention* for *voluntary attention* and *fascination* for *involuntary attention*. It is worth noting that while directed attention is under voluntary control, the use of directed attention can become automatic in certain circumstances. Fascination will be discussed later.

Directed attention (sometimes referred to as executive attention) is the mechanism that permits an individual to focus on a particular stimulus or set of stimuli and maintain concentration for an extended period of time. Directed attention, according to Attention Restoration Theory, also encompasses the ability to suppress distracting stimuli and inhibit the tendency for attention to drift. The importance of directed attention has been noted by many researchers (Posner & Rothbart, 2007). It has been cited as an essential element in activities as

wide-ranging as learning and memory, to emotional experience and cognitive functioning. Directed attention gives an individual the ability to concentrate on perceptions and mental activity such as cognitions and affect (Kaplan, 2001). Directed attention and the ability to inhibit pay an important role in executive brain functioning and the processes that executive functioning carries out (Kaplan, 1995).

Directed attention is, however, a finite resource. Directed attention fatigue occurs when directed attention has been taxed and exhausted after prolonged use (Kaplan, 2001). This diminishes an individual's ability to focus and concentrate as well as suppress unimportant and distracting stimuli. Directed attention fatigue can lead to impaired ability to focus and concentrate, increased irritability, and a heightened susceptibility to accidents and errors (Herzog, et al., 1997). This clearly has implications for human functioning and well-being. Successful functioning requires directed attention to remain alert, from reading and writing to driving a car or performing surgery. In fact, Kaplan (1995) goes as far as to point out that the human error component of many disasters such as airplane crashes, nuclear power plant meltdowns, or ship sinkings might be related to directed attention fatigue. Given the potential for many individuals to experience adverse consequences as a result of directed attention fatigue, it is worth exploring methods that may lead to a recovery and restoration of directed attention processes.

Attention Restoration Theory

According to Attention Restoration Theory, directed attention requires effort, and directed attention can become fatigued through 1.) overuse and 2.) exposure to modern (non-restorative) environments (Kaplan, 1995). Attention Restoration Theory also makes the distinction between directed attention and fascination. As discussed above, directed attention is

the cognitive instrument that allows an individual to focus and concentrate on stimuli that do not inherently attract attention on their own (James, 1892; Kaplan, 1995). Fascination is more akin to James' (1892) concept of involuntary attention, but redefined as the concept of attention that is effortlessly held. Fascination is actually more of a product of the interaction between an individual and their environment, but it can be defined as the product of stimuli that are inherently interesting and do not require the concentrative power of directed attention in order to hold one's interest. Fascination and its place in Attention Restoration Theory is discussed more thoroughly below.

As stated above, directed attention may be diminished due to fatigue, overuse, and exposure to non-restorative environments. Directed-attention fatigue can lead to problems for individuals in the form of negative mood, decreases in executive functioning, and increased likelihood of making errors (Hartig, et al., 1996). Attentional recovery is possible, through the resting of directed attention. Attentional recovery may seem difficult; aside from sleep, attention is constantly employed. Even activities that individuals turn to relax may tax directed attention (e.g. sports, books, movies). The difference between activities that require directed attention and activities that do not require directed attention is fascination, the idea that attention can be effortlessly captured, without directed exertion. A restorative environment will make no demands or minimal demands on direct attention, and will not require the suppression of distracting stimuli (Kaplan, 1995). If the environment can capture attention in this effortless manner, then an individual's directed attention capacity will be given the opportunity to rest and regain its abilities. Many studies and experiments have demonstrated the effect of restorative environments on attentional capacities. A select review of some of this research will provide a

framework for understanding what is being tested and demonstrated, as well as how attention restoration studies traditionally operate.

Attention Restoration Studies

Berman and colleagues (2008) performed two experiments with exposure to restorative and non-restorative environments, coupled with attention-draining tasks. In the first experiment, thirty-eight undergraduate students were administered a measure of mood (the Positive and Negative Affect Schedule – PANAS), and backwards digit-span task. The backwards digit-span task measured attention capacities, and with the number of trials (144 trials lasting a total of 35 minutes), the task had the added effect of fatiguing attention. Participants were then randomly assigned to either go on a 50- to 55-minute walk through either a local park, or through a downtown urban area. The participants then were reassessed with the PANAS and repeated the backwards digit-span task. A week later, participants returned to the laboratory and completed the procedure again, this time switching the environment they took their walk in. Results showed that when participants walked in the restorative environment (nature environment; the park), their backwards digit-span scores improved significantly, but not when they walked in the non-restorative environment (urban environment; downtown urban setting). Increases in positive affect and mood were found to be associated with exposure to natural environment, but were not significantly correlated with performance on the backwards digit-span task.

In the second experiment, twelve undergraduate students were given the PANAS, the backwards digit-span task, and Attention Network Task (ANT), an attentional measure that divides attention into three components: alerting, orienting, and executive attention. Participants then viewed a series of pictures of either a restorative environment (nature settings), or a non-restorative environment (city settings) for approximately ten minutes. Pictures were displayed

for seven seconds, and subjects were then asked to rate how much they liked the picture on a scale of 1 to 3. After viewing the pictures, participants repeated the PANAS, the backwards digit-span task, and the Attention Network Task. After a week's interval, participants returned to the laboratory and repeated the procedure with the opposite set of pictures. Results not only replicated the results of the first study, but also demonstrated that when participants viewed pictures of the restorative environment, their scores on measures of executive attention improved significantly more than when they viewed pictures of the non-restorative environment. Given these results, this study affirmed the predictions of Attention Restoration Theory.

The picture vs. actual exposure in Berman et al. (2008) illustrates another important aspect of Attention Restoration Theory: the restorative experience is not confined to *in vivo* exposure. Pictures or slides of restorative environments were demonstrated to have the same restorative effects as actual exposure to restorative environments. Conversely, pictures and slides of non-restorative environments have the effect of decreasing attentional capacity (Tennessen & Cimprich, 1995). This suggests that it is certain properties of environments that make them restorative, not necessarily immersion in these environments.

Berto (2005) did a series of three experiments that demonstrate the effects of viewing pictures of restorative and non-restorative environments on attentional capabilities. In the first experiment, the researchers administered an attention-fatiguing task (the Sustained Attention to Response Test – SART) in order to simultaneously gain a baseline measurement of attentional abilities and fatigue attention. Participants were then exposed to a series of slides of either restorative environments (nature scenes) or non-restorative environments (urban settings). Participants were exposed to each picture for fifteen seconds, and the total exposure did not last past ten minutes. After this, the SART was re-administered to assess attentional capacities after

exposure to the pictures. Participants exposed to the pictures of the restorative environments recovered their attentional capacities (mainly measured in reaction time to the SART task) and outperformed the participants who were exposed to the non-restorative environments.

In the second experiment, the researchers sought to examine Kaplan's claim that restorative environments effortlessly capture attention with minimal or no need for directed attention, therefore allowing directed attention to rest and recover. They proposed the idea that geometrical patterns also contain the properties of restorative environments. They repeated the same procedure outlined in the first experiment above, but added a third condition that exposed participants to pictures of geometric patterns. The results showed that exposing participants to pictures of geometric patterns, termed "nonenvironments," did not result in attention restoration. In comparison to the restorative (nature scenes) environments and non-restorative (urban settings) environments, performance on the SART for participants exposed to geometric patterns was in the middle. Exposure to geometric patterns did not adversely affect the post-test functioning, nor did post-test functioning improve. This suggests that while geometric patterns may not overload directed attention functioning, they still require some effort on the part of directed attention that keeps them from being restorative (Berto, 2005).

In the third experiment, Berto and his colleagues examined whether attention restoration varied as a function of the amount of time that participants were exposed to the pictures of restorative and non-restorative environments. Participants were allowed to select how long they viewed each picture in the series by pressing a key on a keyboard to move on to the next picture. Results showed that subjects viewed the pictures of restorative environments longer than those of non-restorative environments, but still for less time than when the times were standardized (restorative slides were viewed for a mean of 7038.79 milliseconds, and non-restorative slides

were viewed for a mean of 5104.35 milliseconds). Results also demonstrated no improvement in attentional capacities for either the participants exposed to restorative nor non-restorative environment pictures. The authors offer several alternative explanations, including the idea that participants may have felt more relaxed and therefore less inclined to respond to what may have been perceived as an important pressure to respond quickly to the demands of the SART task. In accounting for the lack of attention restoration, the authors allude to Attention Restoration Theory's position that there are several levels of restoration that an individual may need to go through in order to achieve attention restoration (e.g. emptying one's head, restoration of attentional faculties, addressing the issues that one's mind and reflecting on one's priorities and goals) (Kaplan & Kaplan, 1989). This is likely to be a highly individual process and this experiment may not have allowed adequate time for participants to complete it. In any case, this experiment suggests that there are certain conditions that need to be met in order for attention restoration to occur through exposure to restorative environments.

This last point raises an important question: what are the necessary conditions for attention restoration to occur? Kaplan has proposed necessary criteria, and this will be the focus of the next section.

Properties of Restorative Environments

As was demonstrated by the Berman et al. (2008) study, and a number of other studies (Chang, et al., 2008; Hartig, et al., 2003; Laumann, Gärling, & Stormark, 2003; Tennessen & Cimprich, 1995), not all environments are restorative. The second experiment in the Berto (2005) series also raises the point that it is the properties of the person-environment interaction that determine a restorative environment, not simply the environment itself. Kaplan (1995) proposed four criteria that an environment would have to have in order to be considered

restorative. These criteria are not necessarily inherent properties of the environment itself, but rather qualities of the interaction between the person and the environment. The four properties of restorative environments are "being-away," fascination, extent, and compatibility.

"Being-away" refers to the concept that an environment needs to be different from everyday environments that an individual encounters (Kaplan, 1995). Kaplan points out how individuals will often describe wanting to "get away" in reference to a desire to retreat to a restorative environment. However, the distinction here is of a more conceptual nature; the environment should inspire different thoughts and brain activity than do normal, everyday environments. The spirit of this idea is that the environment is distinct and assists an individual in fostering ways of thinking that are different from the routine thoughts that have become dull and now require directed attention in order to maintain focus. This does not even necessarily require a different environment; if a change in perspective or conceptual shift allowed an individual to view a familiar environment in a new manner, this could now be a restorative environment for that individual. Once again, the underlying principle of the "being away" is breaking out of routine thought patterns that require directed attention to maintain focus.

The second property of a restorative environment is fascination. Briefly mentioned above, fascination refers to an environment's ability to capture an individual's attention in an effortless manner. If an individual finds an environment and the objects in it to be engrossing (hence the term "fascinating"), it will not tax directed attention, and therefore will allow directed attention the opportunity to rest and recover (Kaplan, 1995). The type of environments and items that individuals will find fascinating will vary from person to person, but it is important to note that fascination has been divided into two types: "hard" and "soft" fascination. Environments high in hard fascination are engrossing and will effortlessly capture attention, but

still place demands on directed attention, which keep them from achieving full restorative potential. Environments high in soft fascination will be engrossing, and still effortlessly capture attention, but allow directed attention the opportunity to rest and recover.

One study attempted to look at ratings of restorative and reflective potentials of various environments and activities deemed to be high in hard or soft fascination (Herzog, et al., 1997). Hard fascination is the type of fascination that results from activities that may capture attention but still tax attention (e.g. keeping track of the score when viewing a sports game, following the story of a movie). Soft fascination is the type of fascination that results from activities that capture attention without placing demands on attention (e.g. viewing a captivating picture, watching a nature scene). Researchers asked 187 undergraduate students to rate the restorative efficacy of three types of settings (nature scenes, entertainment and sports settings, and urban settings). Participants were asked to rate these settings on two sets of scales: attention restoration potential and reflection potential (the potential for a setting to result in reflection). Results replicated and upheld the predictions of Attention Restoration Theory; nature scenes were rated highest in restorative and reflective potential, urban settings were rated as lowest in restorative and reflective potential, and entertainment and sports settings were rated in the middle of nature and urban settings. Furthermore, sports and entertainment settings were rated as higher in restorative benefit than reflective benefit, a difference that did not happen in either nature or urban settings. These results suggest that there is a difference between hard and soft fascination environments, and that hard fascination does not induce the level of restoration that soft fascination does. The idea of reflection as a part of attention restoration is an important one, and will be discussed below.

The third property of restorative environments is extent. Extent is the concept that the environment must have sufficient scope and consistency to seem like another world (Kaplan, 1995). The environment must have rationale and coherence in order to keep an individual effortlessly engrossed. A random assortment of images of trees and bushes shown to an individual separately would not occasion fascination or attention restoration, but the same trees and bushes shown in a picture of a park could engage fascination and result in attention restoration.

The fourth property of restorative environments is compatibility. This condition of restorative environments simply states that the restorative environment must be compatible with an individual's goals (Kaplan, 1995). Namely, the individual should be open to having a restorative experience, and this should be compatible with the offerings of the restorative environment. If an individual is not inclined to want or need a restorative experience, then a restorative environment will not be regarded as restorative. Settings that have compatibility will allow individuals to be comfortable and behave in a way that comes naturally to them. For example, an individual may walk in a very restorative environment, but if they are purposefully using their directed attention for some purpose, they are not participating in the restorative experience. To clarify, anxiety that *distracts* from the restorative experience/environment, not thoughts that naturally arise from the restorative experience/environment, would result in a lack of attention restoration. An individual needs to rest their directed attention, and if they are prevented from doing this, then the restorative experience is not compatible with the individual's current needs.

Evidence to date has supported Kaplan's position that these elements seem to be the four core components that define whether or not an individual's interaction with an environment will

be restorative (Berto, et al., 2008; Chang, et al., 2008; Hartig, Kaiser, & Bowler, 2001; Herzog, et al., 1997; Herzog, et al., 2003). Some researchers have developed measurement instruments to assess the restorative properties of environments (Perceived Restorativeness for Activities Scale – PRAS; Evaluation and Likelihood of Behavioral Outcomes scale, see methods section for description), as well as how restorative environments are, and their factor analyses have borne out the predictions of Attention Restoration Theory and the four properties of restorative environments (Herzog, et al., 2003; Laumann, et al., 2001; Norling, Sibthorp, & Ruddell, 2008). However, this raises the question of what environments are restorative. While restoration may be a product of the person-environment interaction, are there some environments that lend themselves more readily to restoration? The next section addresses this issue.

Commonly Restorative and Non-Restorative Environments

Attention Restoration Theory states that the qualities of "being away," fascination, extent, and compatibility are necessary for an individual to see in an environment in order for a restorative experience to take place. While these qualities may be different for each individual, there are some environments that tend to have these qualities in abundance. Kaplan (1989, 1995) posited that natural landscapes are rich in these four qualities, while urban settings tend to have few, if any, restorative qualities. It is understandable that natural environments would be rich in the four qualities of restoration, and all of the studies previously discussed used natural settings to foster attention restoration and urban environments to retard attention restoration processes. One study examined the restorative properties of nature by inquiring with college students, using a self-report inventory, about what features made an environment appear restorative. Researchers found that dramatic nature murals with a water feature were rated as more restorative than mundane nature scenes with built structures, or urban settings (Felsten, 2009).

Results even demonstrated that a nature mural was rated higher in restorative value than an actual window view of real but mundane nature with built structures. These findings seem to support the Attention Restoration principles of environments needing to be fascinating enough to capture attention, and sufficient enough in scope to appear a coherent and different environment.

It is standard practice in attention restoration studies to use nature landscapes as restorative environments and urban settings for non-restorative environments. Most studies in the attention restoration paradigm have found natural environments to be more restorative than other environments. The Herzog et al. (1997) study detailed above under the description of hard and soft fascination demonstrates that natural environments are also perceived as more restorative. In another study that assessed the restorative components of environments, Herzog and his colleagues (2003) had 512 undergraduate students rate 35 natural and 35 urban settings on the four criteria for restorative environments ("being away," fascination, extent, and compatibility), and six additional criteria: openness, visual access, movement ease, setting care, perceived restorative potential, and preference for the setting. The natural settings were rated higher than the urban settings on all criteria, with significant differences for all except for fascination. These results offer additional support for natural settings being more restorative than urban settings. Other studies have come to similar results, supporting Kaplan's hypothesis about natural settings (Laumann, et al., 2001; Staats, Kieviet, & Hartig, 2003).

Problems with Attention Restoration Theory

While the attention restoration literature is limited, it seems to have supported the underlying theory and deserves continued exploration. It has established support for the idea that restorative environments can be used to replenish depleted directed attention reserves, and that non-restorative environments can, in some cases, have detrimental effects on attentional

capacities. At this point, more probing questions need to be asked about the restorative process. One of the most pressing issues is gaining a clearer understanding of what is going on in the mind during the restorative process. While there has been speculation about what is occurring in the mind during restoration and what accounts for the effects of restoration, there have been no experimental attempts at looking at what may be accounting for the restorative process. Some pre- and post-test measures of affect and mood have been incorporated into studies (Hartig, et al., 1996; Hartig, et al., 2003), and one study assessed attention restoration levels at a midpoint during exposure to restorative and non-restorative environments (Berman, et al., 2008), but no attempts at experimental investigation of mental processes of attention restoration have been made. An empirical investigation of the mental processes occurring during restoration would enhance the literature's methodology, provide a baseline assessment of some of the more specific cognitive and affective components of restoration, and increase internal validity by providing random assignment and experimental control over a part of the restorative process that had previously been measured only with pre- and post-test correlations.

Assessing what mental processes may be occurring during attention restoration has larger implications. There is data from the field of meditation research (discussed below) that directly contradicts the idea that resting directed attention is the operational mechanism of attention restoration. This body of research raises questions about what else might be accounting for the effects of restorative environments, and the need for an empirical investigation of alternative processes of attention restoration is apparent.

A logical starting point would be more fully understanding the processes of reflection. Kaplan, in first laying out the framework for Attention Restoration Theory, proposed that reflective processes play a part in attention restoration, and explicitly stated that, "…the key

issue as far as the state of mental fatigue and its recovery are concerned is what happens in the mind" (Kaplan, 1995, p. 502). Attention Restoration Theory defines reflection loosely as observing and/or considering matters that enter the mind, such as problems that an individual currently facing; thinking about one's goals, priorities, and existential meaning (Kaplan & Kaplan, 1989). Though Kaplan states that research and empirical investigation are needed to understand these processes, at the current time, the literature remains sparse.

In a study comparing what sort of mental activity results from different leisure settings, results demonstrated that restorative environments facilitated introspection and orienting oneself to the present (Hull, Michael, Walker, & Roggenbuck, 1996). Many studies have examined mood, attitudes, and affect levels resulting from exposure to restorative and non-restorative environments (Berman, et al., 2008; Hartig, et al., 1996; Hartig, et al., 2003; Hartig, Mang, & Evans, 1991; Herzog, et al., 1997; Staats, et al., 2003), and, as stated above, have consistently found that restorative (natural) environments are rated higher in reflective value and more likely to increase positive affect. In addition to this, the experience of restorative environments is more likely to be positively evaluated than the experience of a non-restorative environment (Staats, et al., 2003). The Berman (2008) study discussed above used a measure of positive and negative mood (the PANAS) to measure affect change when participants are exposed to restorative and non-restorative environments. While statistical analysis suggested that mood change was not associated with increased attentional performance, there was an increase in positive mood after exposure to restorative environments that did not occur after exposure to the non-restorative environments. Given that this study is perhaps the only study assessing mood change coincident with attention restoration, it is not definitive proof that affect does not contribute to the effects of attention restoration; numerous other studies have found that exposure to nature (restorative)

settings is associated with more positive mood than exposure to urban (non-restorative settings). This research suggests that an internalized cognitive and/or affective component may be accounting for some of the effect of restorative environments, but no controlled experimental investigations have validated these ideas. Reflection, as stated, is also a prime candidate for investigation, but has thus far only been considered a correlate of attention restoration, rather than a core component. Fuller consideration of reflection and its operationalization within the experimental paradigm will be discussed following an examination of meditation research and its implications for Attention Restoration Theory.

Meditation and Implications for Attention Restoration Theory

Meditation is a complex, multifaceted realm that consists of many different sets of skills, methods, and purposes (Goldstein, 1987; Smith, 1963). There are many traditions and varieties, and a comprehensive overview is beyond the scope of the current purposes. Despite the various traditions, there are some important commonalities that stretch across multiple types of meditation (Davidson & Goleman, 1977; Goleman, 1988; Manna et al., 2010; Valentine & Sweet, 1999). One distinction that is commonly made to examine meditation practices is dividing meditation into two separate but necessary components: practices that involve focusing attention, and processes that involved open monitoring (Manna, et al., 2010). Open monitoring, also commonly referred to as mindfulness meditation, involves monitoring content in the mind in a non-reactive, non-judgmental manner (Bishop, et al., 2004). This "content in the mind" is described by many researchers as reflective awareness of cognitive, affective, and sensory fields (Lutz, et al., 2008; Manna, et al., 2010). This definition of meditation is strikingly similar to Attention Restoration Theory's description of reflection (discussed above), that consists of thoughts and emotions about oneself and one's life. The division of attention processes and

reflective processes in pursuit of the same outcome in meditation is also similar to Attention Restoration Theory's separation of restorative and reflective processes, though in Attention Restoration Theory, restorative processes have been investigated far more than reflective processes.

What is perhaps the most striking similarity between meditation and attention restoration is simultaneously the source of the largest difference. Meditation and attention restoration practice achieve almost identical results in terms of replenished attentional capacities (Berto, 2005; Hartig, et al., 2003; Manna, et al., 2010; Tang, et al., 2007) through diametrically opposite mechanisms. Attention restoration operates through exposure to restorative environments, leading to a resting of directed attention mechanisms in order to allow attentional capacities to recover, while meditation operates through the focusing of attentional processes in order to increase attentional capacity. Meditation focuses attention, while restorative environments rest attention, and both methods result in increased attentional capacities. The fact that the same results are being achieved through opposite means warrants investigation.

One study (Chan, 2004) involved a series of experiments examining the effects of various forms of meditation on attention. The participants were meditators of various disciplines and skill levels, as well as non-mediator controls. In the first experiment, participants completed the Stroop task to measure attention. Participants who frequently practiced meditation were found to have shorter reaction times than non-meditating controls, suggesting higher levels of focused attention. An important point to note for this experiment that meditators with the highest performance on the Stroop task were the ones that practiced routinely for longer periods each day; years of meditation experience was not a contributing factor. In the second experiment, a global-local letter identifying task was used to measure attention. Once again, meditation

experience was correlated with higher attention scores; while no single subscale demonstrated an effect for meditation experience, global task performance was higher for meditators. The third experiment used a change-direction task that measured attention performance. The way the change-direction task operated created a situation where being able to focus on the present may have positive or deleterious effects on performance; the results suggested that meditators had better performances when the task required focusing on the present moment, though there are some complications with data interpretation. The last experiment in this series used an attentional eye-blink task to examine attention, requiring rapid shifts in attention in very short periods of time, making this a difficult and frustrating task. Results did not indicate that meditators had better performances than non-meditators, but this task seemed to measure abilities that may not be indicators of attention. According to the author, the results of these experiments suggest that individuals who practice meditation are more likely to have higher performances on attentionally-based tasks, correlating with the ability to focus directed attention. Once again, meditation accounted for differences in attentional abilities when measured in time spent daily on meditation (in minutes) rather than years of meditation experience. This would suggest meditation as a skill that needs to be practiced. However, in another study using similar methodology, researchers found that more experienced meditators had better attentional abilities than less experienced meditators (Valentine & Sweet, 1999). One difference in the Valentine and Sweet study is mindfulness meditators displayed stronger performance than concentrative meditators with certain types of stimuli (unexpected versus expected stimuli in the Wilkin's counting test). Together, the results of these two studies suggest that meditation increases directed attention abilities, and that these effects are not only accounted for by attention training,

but through some element of the open-monitoring/reflective component of mindfulness meditation.

Additional support comes from another study (MacLean, et al., 2010). Researchers trained a group of thirty individuals with no meditation experience for five hours a day for three months on Shamatha meditation, which involves training attention on a chosen stimulus, and using introspection to monitor the quality of attention and bring attention back to the chosen stimulus when it wanders (similar to mindfulness meditation). Researchers compared their performance on visual discrimination task that measured perceptual sensitivity and sustained visual attention with the performance of thirty control subjects (wait-list). Results demonstrated that individuals that received meditation training achieved higher scores on the measure of sustained attention. This lends further support to the idea that meditation techniques increase attentional capacities.

An important parallel between studies of meditation and attention restoration concerns physiological arousal and responses. In one study (Patra & Telles, 2010), researchers trained thirty participants in cyclical meditation (a type of relaxation and physical stimulation meditation). The participants had their heart rates monitored during their sleep on the night following a cyclical meditation session. The participants were also trained in another type of relaxation technique for comparison, and had their heart rates monitored during sleep after this type of relaxation as well. Results demonstrated that participants had lower heart rates during sleep on days where cyclical meditation was practiced than when the control technique was practiced.

Another study (Telles, Mohapatra, & Naveen, 2005) found similar results with Vipassana meditation (a type of mindfulness meditation). Researchers assessed fourteen practitioners of

Vipassana meditation before, during, and after sessions Vipassana meditation and sessions of non-meditation. Participants were assessed on heart rate and general physiological stress level. No differences were reported during before, during, or after session for the non-meditation condition. For the Vipassana meditation condition, researchers found that during meditation, participants had a stronger parasympathetic tone (rate of firing in neurons controlling the parasympathetic nervous system, regulating heartbeat, blood pressure, and homeostasis), and an increase in the white vagal tone (impulses from the vagus nerve which increase heartbeat inhibition). These data suggest that meditation practices result in lower heart rate and a calming effect on the body. Similar relaxation effects have been found for attention restoration; in one study (Laumann, et al., 2003), researchers fatigued directed attention and then administered a test of attention (a proofreading task followed by Posner's attention-orienting task) to twenty-eight participants. Participants then viewed a video of either a natural or urban setting, during which their heart rates were monitored. Following the video, participants repeated the Posner task, and participants who had viewed the natural-setting video performed better than those who had viewed the urban-setting video. Results also demonstrated that participants who had viewed the natural-setting video had longer cardiac inter-beat intervals (slower heart rates) as measured from baseline than participants who had viewed the urban-setting video.

Individual research studies as well as literature reviews have reinforced the finding that meditation increases directed attention abilities, as well as demonstrating positive effects for mood and relaxation (Chan, 2004; Lutz, et al., 2008; MacLean, et al., 2010; Rani & Rao, 1996; Valentine & Sweet, 1999). Given that meditation and restorative environments achieve remarkably similar goals through different methods of attention use (focusing attention versus resting attention) these studies further suggest that there is another component that may be

accounting for these restorative effects. Research in both the meditation and attention restoration fields has demonstrated that reflection is a part of their respective processes, but only the meditation literature seems to have addressed and examined reflection as a component of the process, while the attention restoration literature treats reflection as an outcome or side effect. Reflection is conceptualized similarly by both fields, as discussed above, and this suggests that reflection may be a more integral part of the effect of restorative environments than is currently believed. This rationale warrants an investigation into the effects of restorative environments when reflection is increased or decreased. The next section addresses the question of how reflection can be experimentally manipulated.

Reflection

As stated above, meditation defines reflection as an open-monitoring process that consists of observing content in the mind. Attention Restoration Theory maintains this definition, specifying that the content in the mind broadly consists of thoughts, feelings, and sensations related to oneself and one's life. Any experimental design with the intention of manipulating levels of reflection would have to be able to systematically vary the levels of thought and affect in the mind during the restorative experience, which raises the question what sort of prompting could be used to achieve this.

The field of learning research has been making use of prompts to facilitate the learning processes, and a fairly strong literature has emerged out of this. While the definition of reflection used by the learning literature differs from that of attention restoration theory and meditation, the techniques used in these studies demonstrate the ability of thoughts to be prompted and directed with different degrees of specificity. Reflection, as defined by the learning prompt literature, involves cognitive components and attempts at understanding ,

planning, regulation, and monitoring (Davis, 2003). These qualities parallel the definition of reflection in Attention Restoration Theory and the meditation literature. Studies have demonstrated that learning prompts can increase thinking about content and material, and consequently, outcomes related to the content. In one study (White & Frederiksen, 1998), researchers developed a school curriculum that involved using reflective prompts to induce metacognitive processes. This assisted the students in considering and contemplating the material that they were engaged in learning (physics). The students in this study consisted of three classrooms, grades 7, 8, and 9, in an urban school district with many low-achieving students. Researchers also followed a control group of students that did not receive the reflective prompting. Results illustrated that students significantly improved their understanding of physics, improved their test scores, and improved their performance on research projects. Both low- and high-achieving students benefited from the use of reflective cognitive prompts as compared to the control group (White & Frederiksen, 1998). Other studies have found similar results in high school and college settings (Berthold, Nückles, & Renkl, 2007; Glogger, Holzäpfel, Schwonke, Nückles, & Renkl, 2009; Lee, 2010; Peters & Kitsantas, 2010), demonstrating that reflection can be effectively induced. Research has also demonstrated that computer-given prompts in web-based learning environments are also effective at inducing reflection, as well as using videos to record and assist in reflecting (Cheng & Chau, 2009; van den Boom, Paas, van Merriënboer, & van Gog, 2004).

Another compelling piece of this research is examining the use of directed and generic prompts. This idea was first tested in a study where researchers developed directed and generic prompts for the curriculum of 178 middle school students (Davis, 2003). The generic prompts encouraged the students to consider an area of material at certain points in the curriculum,

without any direction as to what particular parts of the material should be thought about. These prompts were simply directed at inducing reflection. The directed prompts provided the students with guidance and tips to assist with more productive reflection. Results demonstrated that students who received generic prompts developed significantly better and more rational understandings of the material than students who received directed prompts. It appears that generic prompts induced a more wide-ranging reflection, while directed prompts channeled reflection into specific areas, and may not have allowed for other ideas to have developed. Students who received directed prompts paid more attention to procedural issues rather than monitoring their level of understanding (Davis, 2003).

The evidence for the effectiveness of directed prompts to increase learning is currently mixed (Furberg, 2009), but research is ongoing. What is important for the purposes of this study is the fact that generic and directed prompts can induce different levels of specificity in terms of cognition and reflection. This implies that it is possible to direct individuals to different levels of reflection and specifics regarding reflection. This would allow for researcher-specified reflection, as well as more broad, participant-directed reflection. This ability to prompt varying levels of reflection and direct the reflection is a key component of the current study; this provides the foundation for experimental conditions where generic prompts could replicate a broad-based reflection style, and directed prompts could induce a more targeted style of reflection.

Prompts for the Current Study

Prompts for the current study consisted of directed and generic prompts for reflection. A no-prompt condition was included for control. The rationale and evidence for the use of prompts is discussed above, but it leaves the question of the content that generic and directed prompts would need to consist of in order to elicit reflection.

The definition of reflection in the Attention Restoration Theory and meditation fields consists of attending to thoughts and emotions about oneself (the definition this study will use). Generic prompts for the current study asked the participant to simply reflect on any broad thoughts and emotions that the participant was currently experiencing, replicating the non-judgmental observation of thoughts that characterizes mindfulness meditation. In order to reach the level of specifically directed reflection that the directed prompt condition required, it was necessary to examine and operationalize the specific components of reflection, rather than the broad thoughts and emotions that characterize the generic, meditative prompts. A reliable source for this information comes from the Evaluation and Likelihood of Behavioral Outcomes scale. The Evaluation and Likelihood of Behavioral Outcomes scale (Hartig, et al., 2003; Staats, et al., 2003) was created in order to obtain information about the restorative experience from participants in attention restoration studies. This scale consists of nineteen items that assess the evaluations and likelihoods of attentional recovery, social stimulation, and reflection. Six of these items comprise the Reflection subscale. These items assess the following: making plans for the future; thinking about relationships with other people; dealing with daily experiences; thinking about important issues; seeing things in a new perspective; and thinking about oneself in relation to other people (Staats, et al., 2003). This Reflection subscale was found to have good internal consistency, with Cronbach's alphas of 0.79 for Reflection evaluation, 0. 85 for Reflection likelihood in natural settings, and .90 for Reflection likelihood in urban settings (Staats, et al., 2003). Other studies that have used this scale have posted similarly high Cronbach's alpha's (Hartig & Staats, 2006). This suggests that these six items are assessing the same construct (reflection), and that they would be appropriate candidates to be adapted in prompts for eliciting reflection.

There would be no need to develop a prompt for the no-prompt control condition, where participants could simply be exposed to a restorative or non-restorative environment without being prompted to reflect.

Components of the Study

As stated above, there have been no attempts at experimentally manipulating reflection in an attention restoration study, so there is no baseline understanding to establish exactly what the reflections consist of. While the Cronbach's alpha scores of the Evaluation and Likelihood of Behavioral Outcomes scale suggest that these constructs do indeed capture what Attention Restoration Theory conceptualizes as reflection, it was important to record the participants' responses in order to establish a fuller understanding of the types of reflections (thoughts, emotions, sensations) that were elicited by the prompts. A coding system was created from the data in order to develop this baseline, as well as to further illuminate the effects of the various levels of prompting on the restorative experience.

A system to record reflections was established whereby participants in the generic and directed reflection conditions were asked to write brief phrases at five separate points during the restorative/nonrestorative phases. In the generic reflection conditions, participants were prompted at the beginning of the restorative/nonrestorative slides to write down a brief sentence about what they were thinking about at the moment (no guidance, similar to non-judgmental observation of thoughts in mindfulness meditation), and were prompted to do this at five separate points during exposure to the restorative/nonrestorative slides (see Appendix E). In the directed reflection conditions, participants were prompted at the beginning of the restorative/nonrestorative slides to reflect on the six areas identified by attention restoration theory as important to reflection (making plans for the future, thinking about relationships with

other people, dealing with daily experiences, thinking about important issues, seeing things in a new perspective, and thinking about oneself in relation to other people), and to write a brief sentence on what they were thinking about when prompted at five separate points during exposure to the restorative/nonrestorative slides (see Appendix F). These written reflections were later coded using a system that distinguished between emotion, personal details, arousal/internal states, and descriptions in order to gain a richer understanding of the effects of reflection and prompting on the restorative experience.

The Positive and Negative Affect Schedule (PANAS) is a much-used and well-regarded inventory of emotionality and mood (Watson, Clark, & Tellegen, 1988), and was used to gather information about the participants' changes in affect and mood resulting from exposure to the restorative environment and reflective prompts. The Evaluation and Likelihood of Behavioral Outcomes scale (discussed above) was used to gather additional information about the reflective and restorative aspects of the intervention. These two measures served as the primary measures of reflection and the effectiveness of the four prompting conditions; the recorded content of the reflections served to further illuminate the results. Attention was fatigued and measured by the Sustained Attention to Response Test (SART). These measures will be further discussed in the methods section.

The prompts to reflect were delivered by placing prompting slides into the restorative/non-restorative environment slides during the restorative portion of the experiment. This assisted in avoiding unnecessary distraction from the restorative experience. As discussed above, keeping the participant fascinated by the restorative environment is necessary for the restorative process (Kaplan, 1995). Prompts that had to be read or prompts given by an experimenter during the restorative exposure would interfere with this.

Summary and Hypotheses

This study examined the frequency and content of different types of reflection during restoration periods in participants exposed to either restorative or non-restorative environments. This study begins the process of understanding what is occurring in the mind during attention restoration. The study was a 2 X 3, 6-cell experimental design. All groups were exposed to an attentionally fatiguing task. Following this task, three groups were exposed to restorative environments and three groups were exposed to non-restorative environments (pictures of these environments in a laboratory). Measures assessing attention were given before and after the exposure to restorative or non-restorative environments. During the exposure, participants were prompted to reflect aloud with a directed prompt or a generic prompt. Participants in the no-prompt conditions were not prompted to reflect. This was intended to provide information on the types and amounts of reflection that occurred in each condition, in addition to the data on attention capacity.

While this experiment is somewhat exploratory, there are some specific hypotheses:

(1) Subjects exposed to restorative environments will have greater recovery of attentional capacity than subjects exposed to non-restorative environments;

(2) Subjects exposed to the reflection-prompting conditions will have greater attentional recovery than subjects exposed to the no reflection-prompting conditions; and

(3) Subjects exposed to the reflection prompting, non-restorative environment conditions will have attentional recovery comparable to subjects exposed to the non-reflection, restorative environment conditions.

Chapter 2

Method

Design

This study used a 2X3 experimental design, with six experimental conditions, crossing restorative or non-restorative environments with type of reflective prompts. All conditions were exposed to an attention-fatiguing task (the SART). Following this task, half of the participants were then exposed to slides of restorative environments, and the other half were exposed to slides of non-restorative environments. This second manipulation consisted of 3 levels of reflective prompts. The first level involved directed prompts to reflect on specific aspects of thoughts, emotions, and sensations during presentation of restorative or non-restorative slides. These prompts were designed to drive reflection in certain directions that are consistent with attention restoration theory's conceptualization of reflection. The second level consists of generic prompts to reflect on what is generally occurring in their thoughts, emotions, and sensations during the slides. These prompts were designed to replicate meditative reflection by fostering reflection in the participant, but allowing the participant to self-direct the reflection, rather than having reflection driven in specific directions as in the directed prompt condition. The final level involved exposure to restorative or non-restorative environments with no prompt for reflection (control conditions).

Participants

Eighty-one undergraduate students (26 male; 55 female) at Indiana State University participated in the study. Participants ranged in age from 18-38, although almost all (96.3%) were of typical college age (ages 18 to 23), with one participant not reporting their age. Of the 57 participants reporting ethnicity[1], 39 were Caucasian (48.1%); 13 were Black (16%); 2

subjects were Asian (2.5%); 1 was Latino (1.2%); 2 were biracial (2.5%). Approximately equal numbers of participants reported being raised in urban (30.9%) and suburban environment (32.1%) environments but the modal participant reported a rural/country background (37%).

Reflective Prompts

The directed reflection prompts were developed from the reflective subscale of the Evaluation and Likelihood of Behavioral Outcomes scale. The reflective subscale of the Evaluation and Likelihood of Behavioral Outcomes scale consists of six items that assess making plans for the future, thinking about relationships with other people, dealing with daily experiences, thinking about important issues, seeing things in a new perspective, and thinking about oneself in relation to other people (Staats, et al., 2003). These were operationalized in the directed prompts; through asking the participants to reflect on these six specific areas, the directed prompts were designed to drive the participant's internal processes to the model of reflection that Attention Restoration Theory conceptualizes (see Appendix F). The generic prompts asked participants to simply reflect on any thoughts, emotions, or sensations that they are experiencing, similar to the non-judgmental observation of thoughts in mindfulness meditation (see Appendix E). These generic prompts were designed to foster reflection but allow the individual participant to determine the direction of reflection, whereas the directed prompts control the direction and areas of reflection. These prompts were given to the participants verbally by the experimenter before the exposure to restorative or non-restorative environment phase of the experiment. At five separate points during exposure to the restorative or non-restorative slides, a question mark appeared on the screen for approximately 7 seconds. Participants were verbally instructed by the experimenter, prior to viewing the slides, to write a

brief sentence about what they were reflecting on at the moment that the question mark appeared on screen.

Measures

Attention Fatiguing Task: Sustained Attention to Response Test (SART)

The SART is a measure of sustained, focused attention (Robertson, Manly, Andrade, Baddeley, & Yiend, 1997). The SART requires the ability to suppress distracting stimuli (Manly, Robertson, Galloway, & Hawkins, 1999). The SART is a computer-based measure; participants are presented with a series of rapidly changing digits (one through nine) and are required to press the spacebar on the keyboard for one or two numbers (the target stimuli), constantly remaining alert in order to catch the correct digits and press the spacebar. This requires continuous and sustained attention to monitor long sequences of digits over the course of several minutes and to alter performance (press key or not press key) based on the noticing an infrequently presented stimulus (the target digit). The SART is an attention-fatiguing task, and the results of the subject's attention performance are automatically recorded.

The SART is an appropriate measure for several reasons. The SART measures the construct of directed attention very well and can be administered in a laboratory setting. The SART is a simple task and easily learned, but difficult and effortful. As stated above, the SART has the additional benefit of being attentionally fatiguing, allowing the attention restoration researchers to measure and fatigue directed attention capabilities in the same task. This is important for simplifying and streamlining the experimental procedure. The SART also controls for any learning effects or short-term memory differences; the participants only need to alter their performance for one digit and there are no procedures or patterns that would likely improve

with practice. Attention restoration studies have used the SART successfully to both measure and fatigue attention (Berto, 2005).

In the current study, participants completed a modified SART in which they were presented letters or numbers and needed to respond by pressing the spacebar in reaction to all stimuli except the number "3" or the letter "A." Participants completed a total of 60 sets of 30 trials each. Thirty sets were completed during the initial or fatiguing phase and 30 additional sets were completed after a restoration period. Key stimuli ("3" or "A")—those that required a different response (actually a refrain from responding)—were randomly presented six times during each set of 30 trials. For analysis, scores were computed as the number of correct responses (actually, failures to respond) on presentations of key stimuli in six blocks (consisting of 10 sets (300 trials); the total possible of correct "responses" per block was 60.

Positive and Negative Affect Schedule (PANAS).

The PANAS is a self-report inventory designed to measure mood (Watson, et al., 1988) (see Appendix C). The PANAS was used to measure affect and mood before and after exposure to the restorative or non-restorative slides, in order to measure how the reflective prompts would influence affect and mood. The PANAS consists of twenty items, divided into two subscales of ten items; one subscale examines positive affect, and the other subscale examines negative affect. The PANAS asks the participants to judge the degree that they have experienced certain emotions within a certain time frame, using a five-point scale (1 = "very slightly or not at all," 2 = "a little," 3 = "moderately," 4 = "quite a bit," 5 = "very much"). Different time frames can specified with the PANAS, so it is possible to tap into feelings and moods at a certain moment or over a range of time (Crawford & Henry, 2004). The participants in the current study were instructed to limit their responses to their current state during both administrations of the

PANAS. Factor analysis on the PANAS (Berman, et al., 2008) found that an underlying two-factor model (positive affect and negative affect, respectively) accounted for the results of the PANAS, and that the PANAS demonstrated high reliability and validity. The PANAS has been used repeatedly in many different types of studies, as well as attention restoration studies. In the current study, the positive and negative scales of the PANAS demonstrated good internal consistency: α =.82 and .93 for positive affect and α = .79 and .83 for negative affect, at the first and second administrations, respectively.

Evaluation and Likelihood of Behavioral Outcomes Scale

The Evaluation and Likelihood of Behavioral Outcomes scale was developed specifically to assess perceived attentional recovery, reflection, and social stimulation likely to result from exposure to certain environments (e.g. restorative or non-restorative) (Staats, et al., 2003) (see Appendix A). It consists of three subscales: Perceived Attentional Recovery, Perceived Reflection, and Perceived Social Stimulation. The first subscale, Perceived Attentional Recovery, consists of seven items. The second subscale, Perceived Reflection, consists of six items. The third subscale, Perceived Social Stimulation, consists of six items. For the purpose of this study, the Perceived Social Stimulation questions were dropped as they did not relate to reflection in the current experiment, leaving 13 Likert scale items. Participants rated each item a scale of 1 to 7 (1 being "Very slightly or not at all" and 7 being "Extremely likely") to represent how likely it is that they would be experience the outcome specified in the item if they were to spend one hour in the setting (that they had just viewed). Both the perceived attentional recovery subscale and the perceived reflection subscale had strong reliabilities (α = .94 and .91, respectively). Although a factor analysis confirmed the existence of two discreet scales, responses were highly correlated, $r = .63$, $p < .001$.

Reflections Scale

While the ELBOS was developed to assess components of the Attention-Restoration conceptualization of reflection, it enquires about how likely the participant would be to experience the outcomes if they were to spend an hour in the environment that was displayed in the slides (see Appendix B). It does not specifically ask about the participants' direct experience during the exposure to the slides. The experimenters believe it was important to directly assess the participants' experience of the environmental exposure on the 6 components of reflection (making plans for the future, thinking about relationships with other people, dealing with daily experiences, thinking about important issues, seeing things in a new perspective, and thinking about oneself in relation to other people) in addition to how they would have felt if they had hypothetically been in the environment for an hour. The Reflections scale was developed by the experimenters to assess the participants' direct experience. This scale consisted of six items assessing the amount of reflection the participants engaged in on each of the six components of reflection (Likert scale items, with 1 being "Very slightly or not at all" and 7 being "Extremely likely"). This scale also served as a manipulation check for the ELBOS scale. Internal consistency of this scale was high, $r = .85$.

Subjective Units of Distress

In order to gain an understanding of the type of physiological effects that the restorative procedure may lead to, a measure of subjective units of distress (SUDS) was developed. A six item measure was created that measured respondents' feelings of excess arousal or distress. Responses were on a 1-to-5 likert scale (1 = none at all, 5 = very much), that assessed how relaxed, calm, peaceful, energized, aroused, and activated the respondent felt (see Appendix D). Chronbach's alpha α = ..65 at the first measurement point and .50 at the second. Item analyses

revealed that excluding a single item ("energized") brought both values to acceptable levels (α = .68 and .62 for the first and second measurement points respectively). Nonetheless, caution is warranted in interpreting results of these scales.

Procedure

Participants were randomly assigned to one of the six experimental conditions (roughly 13 participants in each condition). An experimenter greeted each participant in the laboratory. After informed consent was obtained, the experimenter administered the Sustained Response to Attention Test (SART). The SART was administered for ten minutes in order to properly fatigue directed attention. After the SART administration, the participant completed the PANAS and a Subjective Units of Distress Scale (a combined total of 34 items). The lights in the laboratory were then be dimmed in order to increase focus on the slides and decrease distractions. The participant then viewed a series of slides of either restorative environments (natural settings) or non-restorative settings (urban settings) on a computer screen. In the directed and generic reflection conditions, before the participant viewed the slides, they were advised that they would see question marks appear periodically on screen, and instructed to write down a few words or a brief sentence about what they were reflecting on at the moment the question mark came on screen. Participants in the generic reflection conditions were instructed to think about and write down any thoughts, emotions, or sensations they were experiencing. In the directed prompt condition, the participant was asked to reflect on the following: plans for the future, thoughts about relationships with other people, dealing with daily experiences, thoughts about important issues, seeing things in a new perspective, and thoughts about oneself in relation to other people. The participant was then exposed to the slides. This phase of the experiment lasted ten minutes, in order to provide a chance for a proper restorative experience. The no-prompt conditions were

given no prompts or instruction. After this section of the experiment was completed, the participant was re-administered the PANAS. They also completed the the Evaluation and Likelihood of Behavioral Outcomes scale (Attentional Recovery and Reflection subscales), the Reflections scale, and the Subjective Units of Distress Scale again. The participants then completed the remaining SART trials to establish whether or not attention restoration had occurred. Then they were debriefed. The entire administration was approximately 45 minutes.

Reflection Coding

The written reflections of the participants were transcribed. The transcripts of their responses were then examined for the number of thoughts and emotions expressed.

A coding system was developed in order to analyze the recorded reflections of the participants in the four reflective conditions. Four content categories of reflection were designated as follows: *emotion*, relating to all words or phrases indicating emotions or describing emotions; *personal*, relating to all words or phrases indicating personal experiences (including memories, plans for the future, beliefs, relationship concerns); *arousal*, relating to all words or phrases indicating an internal state of motivation or alertness, such as hunger , boredom, or excitement; and *description*, relating to all words or phrases that describe scenery of the slides (including comparisons to other locations). Six undergraduate research assistants blind to individual participants' conditions coded each reflection as a "1" (if it contained reference to a specific content-category) or a "0" (if it did not). The mean number of each participants' reflections containing each category-code was computed for each coder. Correlations between coders were all positive and highly significant (min $p < .01$). Intraclass correlations were .45 for emotion-coding, .63 for arousal-coding, .77 for personal-coding, and .66 for description-coding. Although the ICC for emotion-coding fell below typically-desired levels (Hallgren, 2012), all

values were highly significant ($p < .001$). Final scores were averaged across the six coders and represent the proportion of each participants' reflections containing the specified content.

Chapter 3

Results

The results are presented in several parts. In the first section of the results, tests for attentional restoration (as assessed by the SART) across the six conditions will be presented. The second section will present the data on affective responses and SUDS measures, in order to provide a measure of the participants' emotional reactions to the scenes. Then data concerning participants' expectations about restoration and reflection are then presented. Finally, data regarding the amount and nature of participants' reflections are presented as are the relationships between participants' reflections and restoration.

Attentional Restoration (SART Assessment)

This study was designed to assess the restorative potential of restorative and non-restorative environmental exposure (specific hypothesis: subjects exposed to restorative environments will have greater recovery of attentional capacity than subjects exposed to non-restorative environments), the effects of prompting on the restorative potential of environmental exposure (specific hypothesis: subjects exposed to the reflection-prompting conditions will have greater attentional recovery than subjects exposed to the no reflection-prompting conditions), and differences between restoration as a function of reflective prompting (specific hypothesis: subjects exposed to the reflection prompting, non-restorative environment conditions will have attentional recovery comparable to subjects exposed to the non-reflection, restorative environment conditions).

Differences in SART (Sustained Attention to Response Test) performance between the restorative (nature) and non-restorative (urban) conditions across three different levels of reflective prompting (no prompting/control condition, generic prompting, and directed

prompting) were examined to test these hypotheses. The reader may recall that SART performance was measured in six blocks of trials, three prior to exposure to the restorative or non-restorative environments, and three after. This is perhaps most readily conceptualized as a 2 [environmental exposure] x 3 [reflective prompt] x (6 [block] x Subject} mixed-factor ANOVA. Although the specified hypotheses which concern recovery of attention after depletion are best tested via contrasts in performance between Blocks 3 and 4 (immediately preceding and following environmental exposure), for completeness, all components of the analysis are initially reported; afterward, contrasts relevant to the specified hypotheses are also presented.

Table 1 contains the means for the correct responses for the three blocks of trials prior to environmental exposure and for the three blocks post-environmental exposure. The ANOVA showed no main effects of environment ($F [1, 75] = 1.28$, ns), reflection ($F [2, 75] = 1.81$, ns), nor their interaction ($F [2, 75] = 0.56$, ns). There was a significant main effect for time ($F [5, 375] = 13.45$, $p < .01$) that was qualified by a significant environment by time interaction ($F [5, 375] = 3.08$, $p < .05$), indicating differences on correct responses between the restorative (nature) and non-restorative (urban) conditions as a function of time. The interaction of reflection by time did not approach significance ($F [10, 375] = 0.75$, ns); nor was the environment by reflection by time interaction significant ($F [10, 375] = 0.56$, ns). While this analysis seemed to verify that the pattern of responses among the groups varied across time (the time main effect) and that those exposed to restorative and non-restorative environments showed different patterns across time (the environment x time interaction) as implied by Hypothesis 1 and also Hypothesis 3, a series of contrasts provided a more direct assessment of their support.

Table 1

Means of Correct Responses at 3 Points During the Pre-Restorative and Non-Restorative Environmental Exposure Administration of the SART Task and at 3 Points During the Post-Restorative and Non-Restorative Environmental Exposure Administration of the SART Task, for 3 Levels of Prompting

	Pre- Environment Exposure			Post-Environment Exposure		
	Time 1	Time 2	Time 3	Time 1	Time 2	Time 3
Prompt						
			Restorative			
None	43.23 (9.64)	40.00 (11.20)	38.00 (11.07)	41.31 (10.83)	36.92 (11.10)	35.08 (12.25)
Generic	41.00 (9.64)	34.85 (11.20)	34.77 (11.07)	40.70 (10.83)	33.39 (11.10)	29.46 (12.25)
Directed	46.86 (9.64)	46.07 (11.20)	41.14 (11.07)	45.29 (10.83)	42.00 (11.10)	37.79 (12.25)
			Non-Restorative			
None	43.74 (9.64)	44.86 (11.20)	42.71 (11.07)	40.79 (10.83)	41.71 (11.10)	40.64 (12.25)
Generic	40.29 (9.64)	42.07 (11.20)	38.57 (11.07)	42.36 (10.83)	39.64 (11.10)	38.43 (12.25)
Directed	45.69 (9.64)	45.08 (11.20)	42.31 (11.07)	42.62 (10.83)	39.77 (11.10)	39.54 (12.25)

Standard deviations appear in parentheses below the means.

Implicit in the predictions (and the logic of the study) is that subjects would experience a diminution of performance across the first three blocks of trials representing a depletion in their attentional capacity. There was, in fact, evidence of a decrease in performance from Block 1 to Block 3 ($M_1 = 43.47$, $M_2 = 42.24$, $M_3 = 39.63$; $F [1, 75] = 30.56$, $p < .001$) indicating a reduction in attentional capacity during this period, although unexpectedly, there was evidence that this drop differed across environmental-exposure groups ($F [1, 75] = 6.92$, $p < .05$). Additional tests

revealed that although the depletion was greater in the groups (later) exposed to restorative environments ($M_1 = 43.70$, $M_2 = 40.31$, $M_3 = 37.97$; $F [1, 75] = 32.88$, $p < .001$), it was also significant for those (later) exposed to non-restorative environments ($M_1 = 43.20$, $M_2 = 44.00$, $M_3 = 41.20$; $F [1, 75] = 4.25$, $p < .05$).

Hypothesis 1 stated that there would be greater recovery of attentional capacity among those exposed to restorative environments compared with those exposed to non-restorative environments. While there was a very slight increase in average performance post-exposure to a non-restorative environment ($M_3 = 41.20$ vs $M_4 = 41.92$), as predicted, there was a bigger increase among those exposed to restorative environments ($M_3 = 37.97$ vs $M_4 = 42.45$); this difference in recovered attentional capacity approached significance ($F [1, 375] = 3.30$, $p < .08$), providing some support for Hypothesis 1.

Hypothesis 2 stated that there would be greater attentional recovery among people in conditions prompted to reflect than in conditions not prompted to reflect. The absence of a reflection by time interaction in the main analysis would seem to give little support for this proposition. Nevertheless, a specific contrast comparing the attentional recovery between Blocks 3 and 4 for those in generic and directed reflection conditions ($M_3 = 40.36$ vs $M_4 = 41.05$).versus non-reflection conditions ($M_3 = 39.20$ vs $M_4 = 42.74$) was performed. Although the means were as hypothesized, this contrast did not approach significance.($F [1, 75] = 1.71$, $p > .15$), offering no support for Hypothesis 2.

Hypothesis 3 predicted comparable levels of recovery in participants exposed to non-restorative environments but prompted to reflect as experienced by those exposed to a restorative environment without a prompt for reflection. In support of this hypothesis, the contrast did not approach significance ($F [1, 75] = 0.16$, $p > .60$). Even though hypothesized, one must be

cautious in interpreting non-significant findings, so it is worth noting that a parallel contrast (between those exposed to restorative environments and prompted to reflect and those exposed to non-restorative environments with no prompt for reflection) was significant ($F [1, 75] = 5.21$, $p < .05$) contra-indicating statistical power as an explanation for the non-significant finding. The data seem supportive of Hypothesis 3.

Emotional Impact (SUDS and PANAS)

A similar analysis was conducted to evaluate the perceived impact of the restorative/non-restorative environmental exposure and reflection on affect and subjective distress (emotional impact). The first part of this analysis of emotional impact was the Subjective Units of Distress Scale (SUDS).

A 2 X 3 X 2 mixed factor ANOVA completed on the SUDS results revealed no significant effects for environment ($F [1, 70] = 0.12$, ns), reflection ($F [2, 70] = 1.20$, ns), or the interaction of environment and reflection ($F [2, 70] = 0.07$, ns). There were significant effects for time ($F [1, 70] = 33.43$, $p < .001$) and for the interaction of environment and time ($F [1, 70] = 6.64$, $p < .05$), indicating that there was a change in perceived emotional arousal between pre- and post-environmental exposure, and that this change was different in restorative and non-restorative conditions. No significant effects were found the interaction of reflection and time ($F [2, 70] = 1.03$, ns), nor the interaction of environment and reflection and time ($F [2, 70] = 1.74$, ns). The main effect for time suggests that the reported level of arousal generally decreased from pre- to post-measurement (see Table 2 for means) in both restorative and non-restorative conditions. The significant environment by time interaction was followed by tests of simple effects for time in restorative and non-restorative environments. The decrease in arousal following exposure to restorative environments was highly significant ($F [1, 70] = 36.00$, $p <$

.001); while the decrease in arousal following exposure to non-restorative environments was less so ($F [1, 70]) = 4.99$, $p < .05$).

Table 2

Means of Subjective Units of Distress (SUDS) for 3 Levels of Prompting at Pre- and Post-SART Task Administration for Restorative and Non-Restorative Environmental Exposure Conditions

	Restorative Environment Exposure		Non-Restorative Environment Exposure	
	Pre-SART	Post-SART	Pre-SART	Post-SART
Prompt				
None	2.94 (.69)	2.28 (.61)	2.77 (.69)	2.26 (.61)
Generic	2.69 (.69)	2.15 (.61)	2.53 (.69)	2.17 (.61)
Directed	2.68 (.69)	1.98 (.61)	2.17 (.69)	2.24 (.61)

Standard deviations appear in parentheses below the means.

A similar analysis was conducted to evaluate the impact of the environmental exposure and reflection on positive affect as assessed by the PANAS (see Table 3 for means). An initial 2 X 3 X 2 mixed factor ANOVA revealed no effects of environment ($F [1, 71] = 1.51$, ns), reflection ($F [2, 71] = 0.16$, ns), or their interaction ($F [2, 71] = 2.67$, ns). There were also no effects for time ($F [1, 71] = 0.30$, ns), the interaction of environment and time ($F [1, 71] = 0.52$, ns), or the interaction of environment and reflection and time ($F [2, 71] = 0.20$, ns). There was a significant interaction of reflection and time ($F [1, 71] = 4.23$, $p < .05$), indicating that positive affect in the subjects changed differently across the different reflective conditions from pre- to post-SART administration. The reflection by time interaction was followed by a test of simple effects for time in each of the reflective conditions. This revealed a significant drop in positive affect in the no-reflection/control conditions ($F [1, 70] = 3.85$, $p = .05$), while positive affect

increased in the directed reflection conditions (F [1, 70] = 3.96, p = .05). No significant changes in positive affect were discovered in the generic reflection conditions (F [1, 70] = .92, ns).

Table 3

Means of Positive Affective Scale for 3 Levels of Prompting at Pre- and Post-SART Task Administration for Restorative and Non-Restorative Environmental Exposure Conditions

	Restorative Environment Exposure		Non-Restorative Environment Exposure	
	Pre-SART	Post-SART	Pre-SART	Post-SART
Prompt				
None	2.28 (.82)	1.95 (.91)	2.32 (.82)	1.98 (.91)
Generic	2.05 (.82)	2.05 (.91)	2.31 (.82)	1.98 (.91)
Directed	2.39 (.82)	2.78 (.91)	1.69 (.82)	1.98 (.91)

Standard deviations appear in parentheses below the means.

Another analysis was conducted to evaluate the impact of environmental exposure and reflection on negative affect (see Table 4 for means). An initial 2 X 3 X 6 mixed factor ANOVA revealed no significant effects for environment (F [1, 71] = 1.77, ns) , reflection (F [2, 71] = 0.45, ns), or the interaction of environment and reflection (F [2, 71] = 1.48, ns). Significant effects were found for time (F [1, 70] = 31.06, p < .01) and the interaction of environment and time (F [1, 70] = 10.93, p < .01), while no significant effects were found the interaction of reflection and time (F [2, 71] = 0.16, ns), nor the interaction of environment and reflection and time (F [2, 71] = 0.72, ns). The significant effects for time and the interaction of environment and time were followed by test of simple effects of time across restorative and non-restorative environments. This revealed a significant drop in negative affect for the restorative environment conditions (F [1, 71] = 39.96, p < .001); although there was a downward trend in negative affect

in the non-restorative conditions, this difference did not approach significance (F [1, 71] = 2.54, ns).

Table 4

Means of Negative Affective Scale for 3 Levels of Prompting at Pre- and Post-SART Task Administration for Restorative and Non-Restorative Environmental Exposure Conditions

	Restorative Environment Exposure		Non-Restorative Environment Exposure	
	Pre-SART	Post-SART	Pre-SART	Post-SART
Prompt				
None	1.61 (.59)	1.22 (.28)	1.59 (.53)	1.45 (.62)
Generic	1.92 (.60)	1.43 (.65)	1.56 (.53)	1.36 (.49)
Directed	1.89 (.68)	1.33 (.44)	1.30 (.30)	1.28 (.33)

Standard deviations appear in parentheses below the means.

Expectations for Restoration and Reflection

The ELBOS has two subscales, the PAR, which measures perceived likelihood of restoration in a setting and the PR, which measures the anticipated level of reflection that would occur. Separate 2 [environmental exposure] x 3 [reflective prompting] ANOVAs were performed on the means of each scale as presented in Table 5.

Table 5

Anticipated levels of Restoration and Reflection after an hour in each setting, by Conditions

	Restorative Environment Exposure		Non-Restorative Environment Exposure	
	PAR	PR	PAR	PR
Prompt				
None	4.11 (1.55)	3.67 (2.08)	2.89 (1.66)	3.11 (1.78)
Generic	4.36 (1.85)	4.33 (1.58)	2.31 (1.36)	2.97 (1.14)
Directed	5.00 (1.33)	5.01 (.1.32	2.62 (1.41)	3.99 (1.57)

Standard deviations appear in parentheses below the means.

A main effect for environmental exposure was significant for the PAR subscale ($F [1, 72] = 29.31$, $p < .001$); as seen in Table 5, participants expected that time in the restorative (nature) setting would be significantly more likely to generate restoration of attention than time spent in the non-restorative (urban) setting. There was no effect of reflection condition ($F [2, 72] = 0.63$, ns), nor an interaction of reflective condition and environment ($F [2, 72] = 0.98$, ns).

A main effect for environment was also significant for the PR subscale ($F [1, 72] = 7.28$, $p < .01$); participants expected that restorative environments would elicit significantly more reflection than time in non-restorative environments. There was also a main effect for reflection condition ($F [2, 72] = 3.48$, $p < .05$) but no interaction of reflection and environment ($F [2, 72] = 0.40$, ns). Additional tests (Tukey comparisons) to examine the main effect for reflection condition revealed that those in the directed reflection condition anticipated reflecting significantly more than those in the no-prompt (control) condition.

Reflection

Additional analyses were conducted in order to assess the amount and content of reflection elicited by the various levels of prompting in restorative and non-restorative environmental settings, as measured by the reflections scale. These analyses were conducted in order to gain an understanding of the effectiveness of the prompts on initiating and eliciting reflection, as well as differences in reflection elicited by generic and directed prompts, and differential effects across restorative and non-restorative conditions.

Amount of Reflection. The "amount" of reflection participants experienced was assessed with the "reflections" scale developed for this study. A 2 [environment] x 3 [reflection] ANOVA was performed on the reflections scale. Means are shown in Table 6. There were no significant differences in the amount of reflection reported between the control, generic, and directed reflection conditions ($F [2, 71] = 1.52$, ns). Those exposed to restorative environments reported more reflections, but the difference was only marginally significant ($F [1, 71] = 2.83$, $p < .10$,). However, there was a significant interaction between environment and reflection condition ($F [2, 71] = 3.31$, $p < .05$). Simple effects revealed that reflection prompting made no difference in restorative environments ($F [2, 71] = 0.99$, ns), but did have a significant effect within non-restorative conditions ($F [2, 71] = 3.69$, $p < .05$). Further pairwise comparisons revealed that the directed-prompt yielded significantly greater reflection in participants exposed to non-restorative environments; no other differences were significant.

Taken as a whole, the results of the analyses on amount of reflection suggest that the attempt to elicit reflection was successful. Although only marginally significant, restorative environments appeared to generate somewhat more reflection, which was evidently not impacted

by prompting. Non-restorative environments may not be as conducive to eliciting reflection without directive prompting.

Table 6

Amount of Reflection (Means) for Restorative and Non-Restorative Environmental Conditions Across Three Levels of Reflective Prompting

	Restorative Environment Exposure Reflection Scale	Non-Restorative Environment Exposure Reflection Scale
Prompt		
None	3.63 (1.62)	3.60 (1.16)
Generic	4.38 (1.29)	2.74 (1.25)
Directed	4.10 (1.27)	4.21 (1.50)

Standard deviations appear in parentheses below the means.

Content of Reflections. As noted above, the content of participants' reflections in the generic- and directed-prompting conditions was also analyzed. The reader will recall that participants in the no-prompt (control) condition were not asked to report on specific reflections. Table 7 presents the results of a series of 2 [environment] x 2 [reflective prompt] ANOVAs that assessed differences in the content of coded reflections (emotion, arousal, personal, description) elicited by generic and directed reflective prompting across restorative and non-restorative environmental conditions. Table 8 contains the means (and standard deviations) for the coded reflections. An ANOVA conducted on emotion reflections revealed no significant effects were found for environment or reflection. A marginally significant effect was found for the interaction of environment and reflection, indicating that the amount of emotion-based reflections varied as a function of the interaction of environment and reflection. Results for

arousal and personal reflections revealed significant effects for reflection in for these types of reflection category, but no significant effects for environment or the interaction of environment and reflection in either of these reflection categories. This indicates that arousal-based reflections personal-based reflections varied between generic and directed prompt conditions. Results for the description reflections revealed a significant effect for environment, but no significant for either environment or the interaction of environment and reflection, indicating that description reflections varied between restorative and non-restorative environments.

Table 7

F-Values for the Amount of Coded Reflections (Emotion, Arousal, Personal, Description) in Reflection-Prompting Conditions

	Environment	Reflective Prompt	Environment By Reflection
Coded Reflection			
Emotion	1.94	0.13	3.31†
Arousal	2.89†	7.37**	1.45
Personal	2.56	19.55**	0.03
Description	4.44*	1.87	1.21

Standard deviations appear in parentheses below the means.
Note: † p < .10
*p<.05
**p<.01

Table 8

Means of Coded Reflections (Emotion, Arousal, Personal, Description) in Generic Prompting and Directed Prompting Conditions Across Restorative and Non-Restorative Environmental Exposure

	Restorative Environment Exposure		Non-Restorative Environment Exposure	
	Generic	Directed	Generic	Directed
Prompt				
Emotion	0.37 (.20)	0.26 (.22)	0.21 (.30)	0.28 (.28)
Arousal	0.39 (.20)	0.17 (.22)	0.23 (.30)	0.14 (.28)
Personal	0.23 (.20)	0.55 (.22)	0.13 (.30)	0.43 (.28)
Description	0.24 (.20)	0.22 (.22)	0.47 (.30)	0.29 (.28)

Standard deviations appear in parentheses below the means.

Finally, to examine the relationship between the experiences of reflection and restoration, I computed correlations between the restoration of attention (the improvement in SART scores from Block 3 to Block 4) and the amount of reflection (as indicated on the Reflections scale) as well as the amount of reflection in each of the coded categories. The total "amount" of reflection of our participants was unrelated to recovery of attention after the break period ($r = .02$) in the sample overall, although intriguingly, the amount of reflection was positively associated with recovery for those exposed to restorative settings ($r = .23$) but negatively associated with recovery for those exposed to non-restorative settings ($r = -.22$). While neither correlation was significant, the difference was marginally significant, $z = -1.94$, $p = .05$.

Reflection containing emotional-content was significantly associated with restoration of attentional capacity ($r = .27$, $p < .05$) and reflection containing arousal references trended the same way ($r = .21$, $p < .10$). Reflection containing personal content was unrelated to recovered attention ($r = .13$) as was descriptive reflection ($r = .08$).

Chapter 4

Discussion

Attention Restoration theory posits that directed attention abilities are recoverable by exposure to environments that contain restorative properties; conversely, environments that do not contain these properties will not lead to recovery of attention faculties (Kaplan, 1995). Numerous studies have affirmed these findings and demonstrated that directed attention capacity can experience restoration following exposure to restorative environments (Berto, 2005; Chang, et al., 2008; Hartig, et al., 2003). The main causal mechanism of attention restoration has been theorized to be "fascination," whereby an individual's attention is naturally captured by the environment, allowing directed attention the opportunity to rest (Herzog, et al., 2003). Most of the research in the field has proceeded under this assumption. However, research from the field of meditation suggests that other mechanisms may be involved (Lutz, et al., 2008; MacLean, et al., 2010). Reflection, as conceptualized in the attention restoration literature, shares many of the qualities of the open-monitoring/mindfulness component of mediation. Given that meditation and attention restoration procedures result in similar attentional retention/recovery outcomes, yet suggest opposite mechanisms of action (resting of directed attention vs. open-monitoring or reflection), there appear to be some implications for the role of reflection within the attention restoration paradigm. Reflection had been previously conceptualized within the attention restoration literature essentially as a side effect or potential benefit of the restorative process (Herzog, et al., 1997) rather than a component of restoration. The purpose of this study was to assess whether or not reflection could be made more pronounced through prompts during the environmental exposure phase, and to examine how this might affect outcomes of the restorative process. It was hypothesized that subjects exposed to restorative environments will have higher

post-test attentional capacity scores than subjects exposed to non-restorative environments; subjects exposed to the reflection-prompting conditions will have higher post-test attentional capacity scores than subjects exposed to the no reflection-prompting conditions; and subjects exposed to the reflection prompting, non-restorative environment conditions will have comparable post-attentional capacity scores to subjects exposed to the non-reflection, restorative environment conditions.

The hypotheses were partly upheld, and the results offer new insight into the role of reflection in the restorative process, as discussed below. To briefly summarize, results demonstrated that the manipulation of directed attention and fatigue was successful, and that attention restoration was experienced similarly to previous studies (Berto, 2005; Kaplan & Berman, 2010); namely that restorative environmental exposure led to greater attention restoration than non-restorative environmental exposure. Perceived arousal was found to drop more in restorative conditions, suggesting restorative environments can reduce arousal, similar to previous findings (Anderson, et al., 2007; Patra & Telles, 2010). Positive affect was found to decrease in the no prompt conditions, but actually increased in the directed prompt conditions, suggesting important implications for the reflection in the restorative process (discussed below). Negative affect was found to drop across all conditions, but this was only significant in the restorative environment conditions. These results for positive and negative affect are suggestive for how restoration is conceptualized. The measures of anticipated and experienced reflection both detected differences in the amounts of reflection. While greater reflection was anticipated in restorative environment conditions, similar amounts of reflection were experienced in restorative and non-restorative conditions for no prompt and directed prompt conditions, but

participants exposed to generic prompting reported greater reflection in the restorative than in the non-restorative condition. These results are discussed in greater detail below.

Regarding different categories of reflection (the coded reflections), results suggest that generic prompting of reflections elicited more emotion-based reflections in the restorative conditions while directed prompts elicited more emotion-based reflections in non-restorative conditions. Generic prompts also elicited more arousal-based reflections regardless of environment, but there was a tendency for participants in restorative environments to report more reflections involving arousal. The amount of personal-based reflections varied based on the type of reflective prompt, with directed prompts eliciting far more personal-based reflections than generic prompt conditions. This suggests that the amount of personal-based reflection can be strongly influenced by prompts. Non-restorative environments elicited more description-based reflection, and although non-significant, the means seem to suggest that generic prompts may magnify this pattern. This suggests that description-based reflection may come more naturally to non-restorative environments, potentially suggesting that when individuals focus on description in their reflection, it lessens the restorative process. These results are explored in greater detail below. The first portion will discuss the relevance of these findings for improved understanding of attention restoration processes. Then, the limitations and potential future directions are reviewed.

Implications for Attention Restoration Theory

The first hypothesis posits that the subjects exposed to the restorative environments will have higher post-SART scores than those exposed to non-restorative environments. As predicted, there was a marginally significant difference in the increased attentional capacity

between restorative and non-restorative conditions, in support of the first hypothesis was therefore supported. This confirmed the general results reported in previous attention-restoration studies.

Looking to the results for the content of the reflections, non-restorative environments elicited more descriptive reflections than did restorative environments. On the one hand, this seems consistent with Attention Restoration Theory as participants' attention must have been focused on the features of the environment in the non-restorative condition, but on the other, it seems contrary to the idea that people are "fascinated" by the restorative environments, with attention effortlessly exploring the environment. People in restorative environments showed a marginally-significant tendency to report more reflections about internal states (and also a tendency—though not significant—to report more personal reflections).It is possible that reflecting on the environment rather than on internal states may alter the restorative process. This could imply that the reflective component of attention restoration is an integral part of the restorative process. Intriguingly, the amount of reflection was positively associated with restoration in restorative conditions, but negatively correlated with restoration in the non-restorative condition; moreover, personal and arousal-based reflections (more frequently reported in restorative environment conditions) were positively associated with restoration experienced, offering further support for this claim.

The second hypothesis stated that subjects exposed to the reflection-prompting conditions would show greater restoration attentional capacity than subjects exposed to the no reflection-prompting conditions. This hypothesis was not supported. Curiously, however, the group means were largely consistent with the prediction: while the no-reflection/control subjects showed a drop in performance post-exposure to non-restorative environments, those in the non-restorative

reflection conditions maintained their performance and even showed increased attentional performance in the generic prompting conditions. With only 13-14 subjects per condition, it is possible then that the test of the interaction predicted by this hypothesis was underpowered. Additional research with a larger sample is clearly warranted.

It was also predicted that subjects exposed to the reflection prompting, non-restorative environment conditions would have attentional restoration comparable to subjects exposed to the non-reflection, restorative environment conditions. This prediction appears to have been supported. For the no-prompt control conditions, restorative environmental exposure resulted in attentional recovery while a decrease in attentional recovery occurred in the non-restorative condition. For the reflection conditions, attentional ability increased for both generic and directed reflection non-restorative conditions (though the increase for the directed reflection non-restorative condition was negligible). It is interesting to note the comparable increase in restoration observed in the generic prompt non-restorative condition versus the generic prompt restorative condition (particularly compared to the directed prompt non-restorative condition). This might suggest that reflection on internal states, emotions, and cognitions is an important component of the restorative process. Perhaps it is the resting of directed attention that allows for internally-directed attention to take place, and this type of reflection leads to a sense of restoration and an increased ability to focus directed attention. This study is a first step in exploring what the role of reflection is in attention restoration, but it raises a number of interesting possible directions and allows for new ideas about the mechanisms of the restorative process.

Affect and Restoration

A short subjective units of distress scale (SUDS) was added to this study in order to assess the perceived physiological changes resulting from the environmental exposure. This allowed the experimenter to gauge the level of physical reactivity and arousal related to the restorative and fatiguing processes as well, as gain a fuller picture of the effects of attention restoration. The SUDS ratings demonstrated significant changes from pre-environmental exposure to post-environmental exposure, confirming previous findings in the attention restoration literature (Chang, et al., 2008; Hartig, et al., 1991). While both restorative and non-restorative exposure groups generally experienced significant downward trends for reported arousal, the restorative environment conditions experienced more reduction in reported arousal than the non-restorative environment conditions (Table 2). This is also in line with previous findings (Chang, et al., 2008). It is interesting to observe that perceived arousal actually slightly increased in the non-restorative, directed reflection condition. Although the 3-way interaction was not supported, this result in particular seems to support the effects of restorative environments. This might suggest that attempting internally-directed personal reflection in a non-restorative environment may be counter-productive to reducing stress. This could very well be the case, given that an open-monitoring approach to stress reduction is at the core of mindfulness. Not being mindful of one's current experience in a non-restorative (or stressful) environment is contraindicated by mindfulness meditation guidelines, and this could explain the increase in arousal seen in the non-restorative directed reflection condition. The non-restorative generic prompt and no-prompt conditions would have likely experienced a more open-monitoring type of reflection (similar to meditation), which could account for the decreases in arousal, given that mindfulness meditation consistently results in decreases in arousal (Anderson,

et al., 2007; Patra & Telles, 2010). These results collectively suggest that perhaps the mind's natural inclination is toward restoration, and when interfered with can result in an increase in perceived stress.

The results for positive affect demonstrate interesting effects for reflection and the effects of prompting different types of reflection. The PANAS was used to assess both positive and negative emotions. It was used by the experimenter to gain an idea of what type of emotional change the subjects would experience, and assess how the emotions are affected by the restorative process. Significant results were found for the interaction of reflection and time, indicating that positive affect changed between the pre- and post-environmental exposure PANAS administrations in the no prompt and directed reflection prompt conditions. It appears that positive affect decreased in no prompt conditions, while positive affect increased in directed prompt conditions (Table 3). There was no change in affect in the generic prompt conditions. These results support a belief in reflection as a component of the restorative process. For the normal restorative process with no reflection prompting (no prompt conditions) to result in a decrease in positive affect, this suggests that the restorative process draws down emotion, which would fit the idea restoration as a renewal, a process of "sweeping away the baggage." For the positive affect to increase during the directed prompt conditions (both restorative and non-restorative) suggests that reflection on meaningful topics could give individuals a sense of reconnection to what they feel is important in their lives, perhaps even allowing them to resolve conflicts that are increasing their cognitive load. This has implications for many areas, including the realm of clinical psychology and the types of topics that therapists choose to focus on with their patients.

For negative affect, results again support the benefits of restorative environments (Table 4). There were significant pre- to post- environmental exposure decreases in negative affect for each of the restorative conditions while the decrease in non-restorative conditions was not significant. This fits in the concept of what occurs in attention restoration. The decrease in negative affect is an important part of restorative process. It could be argued that the decrease in negative affect is even more important than an increase in positive affect as the creation of positive affect is not necessarily an essential part of restoration or relaxation (and may be inhibited by the experimental situation). But decreasing the burden of negative affect may be important for the focus of directed attention. The results suggest that not only are restorative environments conducive to decreasing negative affect, but they also have clinical implications with regards to the types of environments that may be beneficial for individuals with problems with negative affect to seek.

Reflection and Restoration

The reflection results showed differences in anticipated as well as actual reflections between the various levels of prompting. Participants expected more reflection and restoration would occur in restorative environments and similarly experienced (marginally greater amounts of restoration) and reported (marginally) greater amounts of reflection after exposure to restorative conditions. Intriguingly, among participants exposed to restorative environments, greater amounts of reflection were predictive of greater gains in attention, but among participants exposed to non-restorative environments, greater gains in attention were experienced by those reporting lower levels of reflection. These results are important for the hypothesis that

reflection is an important component of restoration, and highlight the importance of exploring the natural content of reflections occurring in restorative settings.

The results also showed that it was possible to "prompt" reflection in non-restorative environments, although only directed prompts appeared successful at doing so. This suggests that restorative conditions may be more conducive to reflection when lacking direction of what to reflect upon.

Content of Reflections (Coded Reflections)

The results of the coding on different types of reflection (emotion-based, arousal-based, personal-based, and description-based) allow a more thorough exploration of how reflection plays out in the restorative experience. The results suggest that those exposed to non-restorative settings were more attentive to setting characteristics while those exposed to restorative environments were more attentive to internal states (e.g., arousal-levels and personal characteristics—although this latter result was not even marginally significant). Although those given directed prompts showed greater levels of personal reflection and also of emotion-based reflection, this latter finding only held among those exposed to non-restorative settings. These findings suggest that restorative environments naturally elicit more internal reflection than non-restorative environments, but this gap may be bridged by directing individuals to reflect on these states.

Results for arousal-based reflection demonstrated a significant effect for type of reflection. There was significantly more arousal-based reflection in generic prompt conditions (Table 5). Patterns of results revealed that generic prompting conditions uniformly elicited more

arousal-based reflection than the directed prompting conditions (Table 6). This is an interesting finding. None of the directed prompts pertained to physiological arousal, as arousal is not normally considered to be part of the reflective experience. But given that unprompted subjects so frequently reported reflecting on their physiological states suggests that arousal may be an important – if unanticipated – component of internally-directed reflection. It is part of the experience that participants felt was meaningful. Perhaps an awareness of physiological states is the first step in an inward-directed meditative state. Given the importance of physiological arousal in emotional experience, one might expect that this reflects partciipants' subjective experience of emotion; however, the reader is reminded that emotion-terms were represented separately in the coding for this study.

The findings for personal-based reflections demonstrated significant effects for the levels of reflective prompts, similar to the arousal-based reflections results. For personal-based reflections, directed prompt conditions elicited significantly more personal-based reflection than the generic prompt conditions. This is not a surprising result, given that the directed prompts essentially contained instructions to reflect on personal topics, but it is an important result. These results confirm that it is indeed possible to prompt individuals to reflect on meaningful topics within the attention restoration paradigm. Given that most of the conditions that experienced restoration also engaged in personal-based reflection, these results add to the overall picture that meaningful reflection is an important component of the restorative process.

For description-based reflections, results displayed significant difference for restorative and non-restorative environmental conditions. The non-restorative environmental conditions elicited more description-based reflection than the restorative environmental conditions. Once again, while these results may not be surprising, they are important. These results suggest that

non-restorative environments do not elicit the type of reflection that is typically associated with a restorative experience. Non-restorative environments seem to draw attention to details of the environment itself, which would require the use of directed attention (rather than elicit more internally-directed reflection). The use of directed attention to pay attention to an environment, rather than attention being effortlessly captured by the environment, violates the "fascination" property of attention restoration and would severely limit the amount of restoration experienced by an individual. These results offer evidence for the type of reflection that makes these environments non-restorative.

Limitations

This study has several limitations. The first limitation, inherent in all attention restoration studies, is the question of the effectiveness of the manipulation. All attention restoration studies of this nature require a fatiguing task and a restorative experience, though there are no clear guidelines for these requirements. The length of time that a fatiguing task is administered, the length of time that the restorative or non-restorative environment is viewed, and the particular specifications of the fatiguing tasks and environments are variable. There are a few rules of thumb for these components (such as extending a task to long enough to create fatigue and extending restorative periods to long enough to allow for restoration but not simply the effects of rest), particularly with respect to *in vivo* environmental exposure versus computer-based environmental exposure. That being said, it would be a worthwhile endeavor to examine and establish optimal time periods and types of tasks in order to limit variability in results and create a standard for potential meta-analysis. It would also be beneficial to establish standardized levels of fatigue and restoration in order to provide a consistent criterion for how fatigue and restoration defined and achieved. While it appears that the manipulations resulted in

results that affirm previous attention restoration studies, it would be helpful to have a set of procedures and guidelines to ensure standardization within the field.

Another limitation is the procedure used to induce reflection. While it appears that it did not interfere with the reflective process, it is difficult to truly know. The question is whether differences were the result of meaningful change resulting from the manipulation of reflection, or if the restorative process was interrupted by the reflective prompts. Efforts were made to streamline the experimental design several times in order to find unobtrusive prompts and minimize the level of interference with the restorative process, but the question of less interference will always exist. This was an exploratory experiment to see if it was even possible to induce and examine reflection, so there is nothing to compare these results with. It may very likely be that there are far less disruptive methods of prompting and assessing reflection within the restorative process, perhaps even methods that may significantly alter or improve the restorative process. While this limitation is a function of the exploratory nature of this study and perhaps better thought of as a direction for future research, it should be noted that this method of prompting could have altered processes that should largely be kept intact, and barring any comparison, it is important to acknowledge this as a potential shortcoming in the methodology.

A further limitation of this study was the picture-based environmental exposure rather than *in vivo* environmental exposure. While picture-based environmental exposure has been shown repeatedly to be effective at evoking the qualities of the person-environment interaction that result in attention restoration, and this is a standard attention restoration practice that has allowed research to take place with greater control, the purposes in this study could very well be at odds with picture-based environmental exposure. It is possible that reflection is different when viewing pictures of an environment compared to actually being immersed in an

environment. It seems plausible that the actual experience of being immersed in nature would affect the emotions and the type of reflection that an individual would engage in. Not only could *in vivo* restorative environments result in changes in reflection, but *in vivo* non-restorative environments could result in a different reflective experience as well. It is not difficult to imagine that reflection would be differentially impacted by an actual loud chaotic urban environment than an urban environment viewed in pictures in a calm laboratory setting. It may be worthwhile to revisit the question of *in vivo* environmental exposure with future reflection exploration.

A final limitation shared by all attention restoration studies as well as most studies in psychology is the diversity of the sample. The current study was a sample of Midwestern college students, which limits generalizability of the results. The geographic area of origin for the sample is a consideration for attention restoration studies because of the types of environments that subjects are familiar with may alter the types of environments that they find to be restorative. Looking to the "being away" criterion of restorative environments, an environment needs to be sufficiently different from the "normal everyday" environment of the individual, so that the individual's directed attention does not need to be engaged and can therefore rest. Research to definitively establish whether everyday environments or environments of origin affect restoration would be very useful in furthering the field's understanding of restoration and honing the requirements of restorative environments.

Future Research

This study has laid a few pieces of groundwork for the role of reflection in attention restoration and suggested a paradigm for investigating reflection. Obviously, the findings here

suggest that reflection plays a more significant role in attention restoration than previously thought. It will be revealing to continue the investigation into reflection in attention restoration. Research to refine this procedure to minimize intrusiveness and maximize effectiveness would allow researchers a deeper understanding of reflection, and it may be possible to enhance the restorative experience for individuals. Similarly, if reflection can indeed enhance or possibly even supplement the restorative process, it may be possible to train individuals to engage in restoration under a variety of conditions, even non-restorative conditions. This would have obvious clinical implications.

The clinical implications should not be overlooked for this study. Given both the amount and types of reflection that the subjects engaged in during the restorative process, it would be worthwhile to gain a deeper understanding of how reflection can lead to beneficial outcomes. Indeed, this research might suggest that the environment that an individual engages in certain types of behavior in may be an important consideration for the goals of that individual. For instance, one of the main components of cognitive processing therapy for posttraumatic stress disorder requires an individual to write out a narrative of their memories and experience of their trauma. For individuals with difficulty experiencing the emotions that were associated with their trauma, the type of environment that they write or retell their narratives in might assist in the processing they have to engage in for recovery. This is just one possibility for potential clinical applications.

Another area that deserves further investigation is how to classify different types of reflection. The current coding system was based on the types of reflection the researcher was hoping to prompt as well as the type of reflection that was believed to result from the environments that subjects were exposed to. While it appears that the design was successful in

prompting reflection and on target in the types of reflection that the participants engaged in, there is little basis for the distinction that was made in categories of reflection. As hinted at above, perhaps more "internally-directed" and "externally-directed" types of distinctions may be more useful and effective in defining reflection categories. As seen in the arousal-based reflections, it may be that internal physiological states may be more appropriately conceptualized along with emotions and personal thoughts as part of the internal experience. Given what is known about the connection between cognition, emotion, and physiological states, conceptualizing this as a type of "internal triad" might be an effective method of delineating reflections.

Conclusion

The results of this study offer support for the idea of reflection as more than a byproduct of the restorative process. These results point to reflection being a multi-faceted, complex component of the restorative process and that different types of environments will elicit different types of reflection. Being able to manipulate reflection opens up a number of new avenues of exploration for attention restoration studies and potentially contains new implications for the field. Seeing reflection in terms of categories (emotional, personal, arousal, descriptive, internal, external) can offer a new way of conceptualizing the restorative process and what is occurring in the mind during attention restoration. This study also raises questions about the nature of attention restoration; it was previously assumed that the "fascination" quality of environments was mainly responsible for determining restoration, but it appears entirely possible that other factors may mediate or moderate the presence or strength of attention restoration. Examining reflection in real time could provide valuable insight into how the restorative process works, perhaps even information on cognitive processing in general. An understanding of how environment affects processing would be valuable to the field in general, and the model put forth

in this study may provide a way forward in examining processing. Going forward it will be important to refine the process and methodology in order to reduce intrusiveness and make prompts more effective. Given these promising results, further exploration appears to be warranted.

[1] The high number of non-reports reflected a researcher error, failure to include an ethnicity question on the first set of questionnaire packets.

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Appendix Content

Appendix A: Copy of the Evaluation and Likelihood of Behavioral Outcomes scale.

Appendix B: Copy of the “Reflections” Scale

Appendix C: Copy of the Positive and Negative Affect Schedule (PANAS).

Appendix D: Copy of the Subjective Units of Distress Scale (SUDS)

Appendix E: Copy of the prompts given to the generic prompt conditions.

Appendix F: Copy of the prompts given to the directed prompt conditions.

Appendix G: Copy of informed consent form

Appendix A
Evaluation and Likelihood of Behavioral Outcomes Scale

This scale consists of a number of questions related to the environment that you viewed in the previous slides. Please rate on a 1 to 7 scale (described below) how likely it is that you would experience each of the following outcomes if you were to spend one hour in the setting that you have just viewed slides of. Please use the following scale to record your answers

1	2	3	4	5	6	7
Very slightly Or not at all	A little	Somewhat likely	Moderately likely	Probably	Very likely	Extremely likely

___ Come to rest
___ Renewed energy
___ Become myself again
___ Loose all tension
___ Place my thoughts in order again
___ Put everything behind me
___ Regain the ability to concentrate

___ Make plans for the future
___ Think about my relationships with other people
___ Deal with my daily experiences
___ Think about important issues
___ See things in a new perspective
___ Think about myself in relation to other people

Appendix B
Reflections Scale

This scale consists of a number of questions related to the reflections that you were asked to engage in during the experiment. Please rate on a 1 to 7 scale (described below) how much you engaged in each type of reflection. Please use the following scale to record your answers

1	2	3	4	5	6	7
Very slightly Or not at all	A little	Somewhat likely	Moderately likely	Probably	Very likely	Extremely likely

On a scale of 1 to 7, how many of your reflections were related to your thoughts of your future plans?
1 2 3 4 5 6 7

On a scale of 1 to 7, how many of your reflections were related to your thoughts of your relationships with others?
1 2 3 4 5 6 7

On a scale of 1 to 7, how many of your reflections were related to your thoughts of your daily experiences?
1 2 3 4 5 6 7

On a scale of 1 to 7, how many of your reflections were related to your thoughts about issues that are important to you?
1 2 3 4 5 6 7

On a scale of 1 to 7, how many of your reflections were related to your thoughts about your perspective on life?
1 2 3 4 5 6 7

On a scale of 1 to 7, how many of your reflections were related to your emotions?
1 2 3 4 5 6 7

Appendix C
Positive and Negative Affect Scale (PANAS)

Positive and Negative Affect Scale (PANAS)

This scale consists of a number of words 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, that is, at the present moment. 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

___ interested	___ irritable
___ distressed	___ alert
___ excited	___ ashamed
___ upset	___ inspired
___ strong	___ nervous
___ guilty	___ determined
___ scared	___ attentive
___ hostile	___ jittery
___ enthusiastic	___ active
___ proud	___ afraid

Appendix D
Subjective Units of Distress Scale (SUDS)

Subjective Units of Distress Scale (SUDS)

Please rate how strongly you currently feel each of the following on a 1 to 5 scale

1	2	3	4	5
Not at all	Somewhat	Moderately	Quite a bit	Extremely

__Relaxed	__Energized
__Calm	__Aroused
__Peaceful	__Activated

Appendix E

Script for Generic Prompt Conditions

The following script will be read to the participants in conditions receiving generic prompts before exposure to the restorative/non-restorative slides.

"In a few moments, you will view a series of slides lasting approximately 10 minutes. You will occasionally see a slide with a question mark on it. When you see the question mark slide, please use the paper in front of you to write down a brief one-sentence description of any thoughts or feelings you are having at the moment. You will see the question mark 5 separate times. Please only use one line of the paper each time you see a question mark slide."

Appendix F

Script for Directed Prompt Conditions

The following script will be read to the participants in conditions receiving directed prompts before exposure to the restorative/non-restorative slides.

"In a few moments, you will view a series of slides lasting approximately 10 minutes. You will occasionally see a slide with a question mark on it. When you see the question mark slide, please use the paper in front of you to write down a brief one-sentence description of any thoughts or feelings you have regarding one or more of the following: your plans for the future, your relationships with other people, your daily experiences, issues that are important to you, or perspectives on life. . You will see the question mark 5 separate times. Please only use one line of the paper each time you see a question mark slide."

Appendix G

Informed Consent Form

CONSENT TO PARTICIPATE IN RESEARCH

The Effects of Reflective Prompts on Attention in Restorative and Non-Restorative Environments

You are asked to participate in a research study conducted by Ryan Dumke, M.S. and Dr. Virgil Sheets, from the Psychology Department at Indiana State University. This research is being conducted for the purposes of a dissertation. Your participation in this study is entirely voluntary. Please read the information below and ask questions about anything you do not understand, before deciding whether or not to participate.

• PURPOSE OF THE STUDY

This study is attempting to examine the effects of restorative experiences on attention. More specifically, the researchers are attempting to explore how attention is rested and restored after extended use. This includes the mental mechanisms that may be affecting to what extent our attention is affected by what you might be thinking when exposed to certain stimuli.

• PROCEDURES

If you volunteer to participate in this study, you will be asked to do the following things:

You will be asked to complete an attention-based task designed to measure your attention capacity. Specifically, you will be asked to view a computer screen press the key on the keyboard that corresponds to the key displayed on the computer screen. This will last approximately ten minutes. Following this, you will be exposed to a series of pictures on a computer screen. You may be asked to write down a short sentence about what you are thinking about at certain points while viewing these pictures. This slideshow will also last approximately ten minutes. Following this, you will fill out three short surveys about your current mood. Afterwards, you will complete the attention-based task for about another ten minutes to complete the study.

The total amount of time that your participation in this study will require is approximately forty-five minutes.

• POTENTIAL RISKS AND DISCOMFORTS

There are no potential risks associated with participation in this study.

- **POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY**

There are no potential direct benefits to participants in this study. The greater benefit is expected to be to the community of scholars trying to understand attention processes and to the practitioners trying to design places that allow restoration of attention.

- **PAYMENT FOR PARTICIPATION**

You will not receive any compensation from the researchers for your participation. Should you elect to participate, you may receive credit in your psychology class in accord with Department Policy (Check with your psychology instructor(s) for details).

- **CONFIDENTIALITY**

No identifying information is requested in this study. You will be assigned a participant code number that will be entered into the program measuring your attention and on other surveys. Your data will further be aggregated with that of other participants for reporting so that no individual responses will be identifiable. Consent forms and sign-up sheets (which contain names—but no participant id codes) will be retained in Dr. Sheets' locked research space.

- **PARTICIPATION AND WITHDRAWAL**

You can choose whether or not to be in this study. If you agree to be in this study, you may still decline to answer any questions and/or withdraw at any time without adverse consequences. Your data will be discarded if you choose to withdraw your participation.

- **IDENTIFICATION OF INVESTIGATORS**

If you have any questions or concerns about this research, please contact Ryan Dumke (rdumke@sycamores.indstate.edu, 310-941-9275), or Dr. Virgil Sheets (Virgil.Sheets@indstate.edu,

812-237-2451).

- **RIGHTS OF RESEARCH SUBJECTS**

If you have any questions about your rights as a research subject, you may contact the Indiana State University Institutional Review Board (IRB) by mail at Indiana State University, Office of Sponsored Programs, Terre Haute, IN 47809, by phone at (812) 237-8217, or e-mail the IRB at irb@indstate.edu. You will be given the opportunity to discuss any questions about your rights as a research subject with a member of the IRB. The IRB is an independent committee composed of members of the University

community, as well as lay members of the community not connected with ISU. The IRB has reviewed and approved this study.

I understand the procedures described above. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

_____

Printed Name of Subject

_____ _____

Signature of Subject Date