



AN ABSTRACT OF THE THESIS OF

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This study sought to fill a void in research literature supporting Attention Restoration Theory (ART) and the beneficial effects of exposure to natural, green spaces. The literature predominantly discusses studies with adult and older child participants, finding that exposure to natural environments often produces an attention-restoring effect. ART has been studied for effects among adult and adolescent populations; children over age seven have largely been excluded. Participants in this study were preschoolers aged 3-5 years. They were exposed in three conditions to a maze task to focus their attention and then alternately asked (1) to sit quietly, (2) look out a window and describe the view, and (3) to sit on a bench in a patio garden. After each exposure condition, they repeated the maze task to determine their perceptions and reactions to the garden space. Children were randomly selected to begin their interviews in each of the three conditions.

Qualitative analysis of their responses revealed expressions of positive regard and interest in the patio garden being provided only when they sat in it. Describing the view out the classroom window, they listed slightly more natural than built elements;

when sitting in the garden they talked more about natural than built elements. They appeared to remain focused on indoor activities in Conditions 1 and 2 and more focused on external or outdoor activities in Condition 3 (sitting in the garden). In research adults commonly report feelings of relaxation when viewing a garden, the children in this sample did not appear to be affected in any way by viewing it distally. Only when immersed in it did they indicate enjoyment of it. This suggests that children may perceive and experience space differently than adults do.

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Preschooler's Perceptions of a Patio Garden

By  
Deborah A. Upington

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I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

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Deborah A. Uppington, Author

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Though their names were changed, their smiles and voices remain.

Preschooler's Perceptions of a Patio Garden

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## Chapter 1 Introduction

*1.1 Overview and Problem Statement*

Research in the fields of attention, environments and human behavior suggests possible links between a person's attention and their exposure to natural environments, by directly viewing, visiting or looking at images of natural spaces (Berto, 2005; Ivarsson & Hagerhall, 2008; Kaplan & Kaplan, 1995; Louv, 2005; Taylor, Kuo & Sullivan, 2001). Studies have evaluated the uses of natural spaces for recovery from attentional stressors (Berto, 2005; Cackowski & Nasar, 2003; de Kort, Meijnders, Sponselee & IJsselsteijn, 2006; Gulwadi, 2006; Staats, Kieviet & Hartig, 2002; van den Berg, Koole & van der Wulp, 2003), effects on one's predisposition for future interaction with nature and conservancy efforts (Chawla, 2007; Francis, 1995; Powell, 2007; van den Berg, Hartig & Staats, 2007; Wells, 2000), and in motivation for increased physical activity as a means to fight or prevent obesity (Fjørtoft, 2004; Lewicka, 2005). These studies highlight the impact the natural environment has on human behavior, addressing neural and psychological processes as well as health effects.

Researchers have approached the topic of environment and attention from different directions, such as anticipated vs. actual (viewing) experience (Korpela & Hartig, 1996; Scopelliti and Giuliani, 2004; van den Berg, et al, 2003), or immersion vs. distal viewing (Korpela & Hartig, 1996). Findings consistently point to the benefits of interacting with natural settings for attention restoration; either by distally viewing a scene or actively engaging it. Engagement on any level appears to result in increased directed attention. In the majority of their studies, both Hartig and Korpela (1996,

2003) use primarily university students in the United States and the Netherlands as participants in their work. They have examined the restorative effects of natural spaces (both familiar and unfamiliar) via slides and participant imagination to evaluate potential attention recovery after a stressful situation such as exams or lectures (Hartig, Evans, Jamner, Davis & Gärling, 2003; Korpela & Hartig, 1996).

Environmental psychology studies have documented restorative effects in behavior following exposure to natural environments, such as hospital-based healing gardens (Hartig & Marcus, 2006; Whitehouse, Varni, Seid, Cooper-Marcus, Ensenberg, Jacobs, & Mehlenbeck, 2001) and urban parks (Gulwadi, 2006; Kaplan, 2001; Kaplan & Kaplan, 1995; Korpela, Hartig, Kaiser & Fuhrer, 2001); however these studies have not included very young children (under age seven) as participants (Bagot, 2004). Additionally, there remains debate as to the actual source of the restorative experience, specifically, whether it was physical activity during the exposure to the environment or if it was the environment itself which provided the positive effect (Louv, 2005). Other challenges exist in several of the studies, particularly the methodology of some which require participants to 'imagine' the experience of stress, place or restorative effect (Hartig, et al, 2003; Korpela & Hartig, 1996; van den Berg, et al, 2003).

Attention Restoration Theory (Kaplan & Kaplan, 1995) provides a foundation for much of the work discussed above, seeking to explain an apparent connection between exposure to restorative, natural spaces and the recovery of directed attention. Kaplan's theory posits that these spaces enhance mental respite and restore one's fatigued attention by allowing a respite to directed attention with involuntary attention

taking over. The use of natural spaces in restoring attention to young children has not been fully investigated (Louv, 2005). It would be of service to early childhood education, childcare and preschool programs and teachers to study the interactions of children and exposure to natural environments as an attention-restoring mechanism during preschool hours. Children this young are still developing self-control behaviors, they may need guidance in finding ways to calm themselves and re-engage their attention to both learning and group activities. In addressing the effects of a restorative experience on attention, one must try to ascertain the depth of the experience required to achieve the effect. Is the activity of being physically in the environment (Louv, 2005) adequate; would simply viewing such a space suffice (Kaplan, 2001; Ulrich, 1984, 1981) or could even thinking about the space provide some measure of restorative effect? In this study I hoped to determine whether the effect of exposure to a natural space, either by directly viewing or by sitting in such a space, may have beneficial effects on young children's attention to a maze task, which is a directed-focus task.

The current literature on restorative environments and young children is limited by the paucity of data regarding the interactions of the very young, particularly those under the age of five, and what, if any, effect differing levels of exposure to an outdoor, natural or green space may have on them. Very young children are still developing perceptions, cognitive and experiential skills upon which to base their reactions. These children are faced with a multitude of attention-fatiguing events: the excitement of being around other children, exposure to new activities as they enter preschool or other social settings, and the stimulation provided by novel environments

as they explore and engage them. By learning what effect, if any, access to a natural space for viewing or active engagement has on their attention, I may be able to find clues toward redirecting young children's attention in preschool settings.

### *1.2 Objectives*

This is a qualitative study using Grounded Theory analytical techniques. The objective was to determine what the preschooler's perceptions of the differing conditions were, specifically how they responded to sitting quietly between tasks, looking out a window and sitting in the garden. I focused my attention on the children's words and physical reactions to each intervention and their apparent perceptions of each. Sifting through their responses, I found patterns in their behaviors, words and reactions to the differing conditions. As Glaser and Strauss (Glaser and Strauss, 1967) describe it, rather than beginning a study with a hypothesis, one starts with research questions; in this case, how do preschoolers perceive a patio garden? Does it have any influence on their behavior either while viewing it, sitting in it, or after exposure to it? A Grounded Theory framework takes accumulated data, such as behavior or input from interviews (both, in this study) and sorts through the gathered information for meaning. It seeks out patterns in the responses, builds a new set of information to guide future work, and may go as far as generating a theory or additional research questions about the condition or behavior based upon the gathered data. This study sought to find data to provide to the research community regarding the reactions of very young children to a patio garden space.

## Chapter 2 Review of Literature

### *2.1 Overview*

In this chapter, background is provided on Attention, Attention Restoration Theory, restorative environments, and prior studies of natural and built environments and their effects on attention in adults and older children. Grounded Theory, as a method of data analysis, is discussed to support the revised analysis. These studies are multidisciplinary from psychology, neurology, landscape architecture, and medical science.

### *2.2 Attention*

Directed attention comes about from a voluntary effort to focus one's cognitive efforts toward a specific problem or task. It "requires effort, plays a central role in achieving focus, is under voluntary control (at least some of the time), is susceptible to fatigue..." (Kaplan, 1995, p. 170). Directed attention is used when one is driving a motor vehicle, working on a math problem or other cognitively challenging or effortful tasks. These tasks may require one to attend to multiple sources of information, such as visual, physical and tactile sensations. Similarly, they could be very tedious chores which require a high level of detail. Additionally, during the day people are bombarded with sensory information; this, in addition to the mental effort involved in perceiving, interpreting, and responding to multiple stimuli, can result in mental exhaustion. Directed attention can be wearying; it requires focus and the use of multiple senses, often leading to mental exhaustion. It drains one's cognitive resources and requires effortful control in the face of multiple sources of potential distractions.

As Scopelliti & Giuliani (2004) comment, “Being involved in interesting stimuli makes directed attention temporarily unnecessary and allows it to recover” (p. 242).

Involuntary attention is that which requires no effort; it allows directed attention a respite, comes easily and is less likely to be susceptible to fatigue (Kaplan, 1995). It is used in relaxation, such as when taking a walk through a park; one's gaze roams over the scenery, absorbing the colors, shapes and textures, but without directed effort.

The result of overwhelmed directed attention and the facilitation of involuntary attention is attention restoration, something which causes the individual to relax, while remaining alert and conscious; a view or an event that will interest the individual and draw their attention, but in a relaxed way, such as viewing a garden. Involuntary attention provides this respite; the eye and attention follow a line of shrubs or a wandering path, but without mental exertion. The imagination may wander, or take over, but the individual does not have to actively attend to the scenery to appreciate it. Kaplan (1995) describes the restorative experience as an “alternative mode of attending that would render the use of directed attention temporarily unnecessary” (p. 172).

Kaplan presents insights into the consequences of failure of directed attention. When prolonged, directed attention can result in fatigue or exhaustion; this in turn can lead to less successful interpretation, cognitive processing or analysis of, and response to, sensory input. Errors are made, confusion and distraction may set in and mental acuity is lost (Kaplan, 1995; Kaplan & Kaplan, 1995; Scopelliti & Giuliani, 2004). According to Kaplan, directed attention fatigue may result in thought inhibition and

affect diminution, impaired perception, irritability and impatience or inability to reflect.

Very young children have the additional burden of not only participating in the above experiences, but also trying to engage and interact within their environments, which may consist of entirely new places and experiences for them as they grow and develop. Often these children are experiencing prolonged demands of their directed attention from teachers for the first time when they begin preschool (Furman, 2005).

### *2.3 Attention Restoration Theory*

Attention Restoration Theory, or ART, suggests that natural settings may have a restorative effect on human attention (Kaplan & Kaplan, 1995; Taylor, Kuo & Sullivan, 2002). Kaplan's ART (Kaplan, 1995) discusses human affiliation with nature as being a key component in restoring one's directed attention, promoting stress reduction and sense of well-being. As one participates in directed-attention tasks, such as studying, reading or work, attentional fatigue sets in and directed attention is decreased (Berto, 2005; Herzog, Black, Fountaine & Knotts, 1997; Scopelliti & Giuliani, 2004). Scopelliti, et al, (2004) found that across the lifespan (ranging from young adults to the elderly) participants expressed preference for natural spaces for attentional recovery. While the elderly sample seemed to prefer their home environments to natural settings for overall restorative effects, the adults and young adults both expressed preference for natural settings for overall restorative effects; *all groups in the study voiced high regard for natural settings.*

By relaxing directed attention and instead participating in involuntary attention tasks, such as wandering through a park or gazing out a window (Gulwadi, 2006; Ulrich, 1984), one may recover from fatigue and restore his/her directed attention (Berto, 2005; Taylor, et al, 2002). Gulwadi (2006) found that in a sample of 71 urban elementary school teachers, those with particularly high-stress positions seek cognitive restoration in their home, church and natural environments, with natural settings increasingly preferred as stress increases. When needing seclusion, they sought their homes or natural settings to recover from stressful days working at the school.

Taylor, et al, (2002) found that girls who had a view of natural spaces from their home windows showed improved scores in tasks measuring impulse inhibition, concentration and delaying gratification. While boys did not show measurable differences this could be confounded by the environment in which they lived. The study was conducted in a Chicago public housing development, in which girls may be less likely to venture outside the safety of their homes, relative to boys.

Herzog, et al (1997), further discuss attention recovery in two stages; “attentional recovery” and “reflection”. The authors deepen the discussion of restoration of the attentional processes and recovering one’s cognitive ability. According to the authors, after attention has been recovered one may then move further to a deeper, more intense state of concentration and be able to focus on deeper personal issues that may require attention. In “attentional recovery”, involuntary attention has taken over, providing a respite for directed attention to be restored. In “reflection”, the cognitive processes have moved to a stage in which one is able to ponder more deeply a concern, fear, or even a past event that one was previously

unable to cope with, or address, due to the need for directed attention to more immediate concerns.

#### *2.4 Restorative Environments:*

Restorative environments are spaces where one may go to achieve relaxation, physically and/or mentally (Kaplan, 1995; Whitehouse, et al., 2001). They may take the form of a 'healing garden', a city park, a quiet room or mountain range. It may be entirely natural or contrived, designed to optimize aesthetic features in order to draw visitors. These spaces often feature natural, outdoor elements. Findings from Taylor, et al, (2002) suggest that exposure to green spaces may promote attention restoration for ADHD children. Kaplan's work (Kaplan, 1995; Kaplan & Kaplan, 1995) further adds to the growing body of research regarding the beneficial effects of exposure to natural environments. The most common procedure in these studies involves participants completing a task requiring sustained, effortful (directed) attention, exposure to a natural, restorative environment, and a repetition of the directed attention task. Findings consistently suggest that exposure to a natural setting, whether from viewing or actively engaging it, restores attention (Berto, 2005, Louv, 2005) and promotes relaxation (Kaplan, 1995; Kaplan & Kaplan, 1995; Taylor, et al, 2002, Whitehouse, et al., 2001). Berto's study (2005) consisted of participants viewing slides of varying landscapes (natural scenes or urban scenes) and subsequently performing an attention-intensive task, the *Sustained Attention to Response Task*, or SART. She found that Italian university students viewing the natural landscapes gave more accurate and faster responses than those viewing urban landscapes. The slides had been previously

rated for their restorative effects according to the Perceived Restorativeness Scale (PRS, discussed below) in a pilot study by a separate group of undergraduate students for validity.

Places that are restorative provide four key elements from Kaplan's theory: *fascination, extent, compatibility* and a sense of '*being away*' (Ivarsson & Hagerhall, 2008; Kaplan, 1995; Kaplan & Kaplan, 1995). A physical space must be interesting enough to engage the mind of the observer and draw them in – this fascination provides the effortless attention required for a restorative experience. "Extent" refers to the complexity of the setting; it must be rich enough to provide the participant a depth of experience that is fulfilling to their intent. The landscape or décor must be adequate to give the sense of being in a place that is coherent. "Compatibility" refers to the suitability of the place to meet the observer's needs and desired goals. Finally, the space must provide a "sense of being away" from one's everyday life and concerns; while it may not be physically distant from their home, it must be varied enough that it provides a new, stimulating experience, a sense of being removed from one's daily routines. As a whole, the restorative place should draw one's attention and hold it, creating a feeling of relief from everyday concerns, of mental relaxation. This fascination with the place is an interaction between the viewer and the environment; it is an effortless experience, a drawing in of the observer. It may occur in an active or passive environment; a stroll through a 'healing' garden (Hartig & Cooper-Marcus, 2006; Ousset, Nourhashemi, Albarede & Vellas, 1998) or sitting in a park could provide such a passive, restorative experience; a rock climb on a particularly challenging cliff face, drawing the experienced climbers' focus and providing an

athletic challenge to attain the summit is a very active restorative event for those with extensive experience in climbing. De Kort, et al, (2006) used virtual environments to study the efficacy of a simulated environment to reduce stress. This study evaluated the efficacy of a simulated environment for stress recovery among 80 young adults, aged 20-28 years and gave support to the hypothesis that immersion in a virtual environment is restorative.

Fascination, one of the components of attention restoration, is framed in a range of 'hard' to 'soft' (Herzog, et al, 1997). Hard fascination is an intense experience, drawing all of one's attention allowing for little else. Soft fascination is of lesser intensity and allows the mind to wander and reflect upon potentially painful concerns. These settings must be more aesthetically pleasing, contributing further to the restorative experience of reflection and potentially leading toward attention recovery. ART requires environments that contribute to one's attention in a meaningful way, allowing one to relax, focus and reflect; natural environments lend themselves more toward these experiences, as they require less directed attention than urban environments do. Upon completion of the restorative experience, one is ready to resume his/her work, studies or other attention-consuming tasks. Even very brief exposure, such as to a lush median on a highway or roadside can affect driver behavior, decreasing frustration (Cackowski & Nasar, 2003). There are urban and interior environments which may serve as restorative settings, such as museums (Kaplan, 1995) but for purposes of this paper, I focused on exterior spaces.

Scopelliti and Giuliani (2004) discuss the lifespan as a potential variable overlooked in prior studies; as one progresses through life, needs and responses to

stimuli change. This study evaluated residents of a small Italian town at three different stages of life, and found differences in response to the four domains of ART. Younger participants selected different environments than older participants did, and elderly participants chose less stimulating environments for their preferred environments.

Taylor, et al, (2002) studied the effects of natural views on self-discipline among children aged 7-12 years living in a Chicago public housing development. Parents were interviewed to confirm whether their apartments had windows overlooking views of natural or built landscapes; children were interviewed and evaluated for three levels of self-control behaviors related to attention: concentration, impulse inhibition and delayed gratification. Girls who had views of natural areas from their homes showed improved scores over girls who had views of built areas; there were no significant differences among boys.

Van den Berg, et al, (2003) found the type of environment, built or natural, affects preference and response to the restorative potential of each site; natural views were preferred and found to more positively increase attention restoration on a task given to college students in the Netherlands. In this study, a filmed view of a natural or built environment was shown to participants after they watched a stress-inducing film clip. However, a potential problem in this study is the nature of the extremely graphic film, which may have escalated or otherwise influenced the participants' responses to viewing anything else, or even the end of the stress-inducing video itself. The views of the potentially restorative sites were also presented as a video rather than directly experienced; the relatively shallow immersion of the participants may also have impacted the findings.

As Louv (2005) recommends, future research needs to address the potential differences between viewing a natural scene through a window and actually walking through one, actively engaging it; however, this adds to the potential for confounding physical activity as a factor (Holmes, Pellegrini & Schmidt, 2006; Louv, 2005), construing the effects of physical activity with those of indirect attention to the environment. Other limitations of many of the restorative environment studies include homogeneity of the samples, age of participants (the majority include undergraduate students), clear definitions and consistent criteria of 'restorative environment' and methodology. The use of imagination (such as in de Kort, et al, 2006; Herzog, et al, 1997) to create an artificial attention-fatigued mental state and expectation of recovery may not be the most effective way to find actual results or benefits as opposed to perceived; anticipated results may differ dramatically from actual outcomes.

Taylor, Kuo & Sullivan (2002) studied the effects of having a view of a natural setting outside a bedroom window ('nearby nature') on self-regulation, including attention performance, impulse inhibition and delayed gratification among twelve-year old children; findings supported the positive effects of exposure to green spaces on attention, particularly among girls. In another study with nation-wide participation, Kuo & Taylor (2004) found that children aged 5-18 consistently showed reduced symptoms and more positive aftereffects after walking through green natural spaces after an attention-draining task.

Staats, et al, (2003) discuss a potential confounder in some environmental attention restoration studies; the possibility of the physical place being analyzed already known to the participants, who may have experienced positive or negative

events there. For example, a photograph of a popular park may be unduly correlated with a restorative experience if the participant had a picnic there recently with family or friends; they would already have a positive association with that particular space that could influence their responses in the study.

Environmental studies directed toward children traditionally performed by adults with the intent of providing optimal places for children to grow, learn and work, have begun to include older children (over age seven) as participants in the investigation process (Holmes, et al, 2006; Kyttä, Kaaja & Horelli, 2004b). Younger children (under age seven) are slowly being incorporated into environmental research, particularly how it affects their behavior (Björklid & Nordström, 2007; Evans, Brauchle, Haq, Stecker, Wong & Shapiro, 2007; Holmes, et al, 2006; Korpela, Kyttä & Hartig, 2002; Louv, 2005; Taylor, et al, 2002) and how they perceive it (Kyttä, et al, 2004; Rasmussen, 2004) but with only to a limited degree. Children under the age of seven have been neglected in research studying their interactions with, and perceptions of, the natural environment.

Trancik and Evans (1995), in their study of preschool settings, stated “Restorative environments present an opportunity to get away, to take time out, and to escape from physical or cognitive fatigue...” (Trancik & Evans, 1995, p. 50). Very young children, particularly those newly experiencing life outside their own homes, are still developing their ability to restore themselves and recover from attentional overload; providing an environment that would give them an opportunity to do so, or that would enhance the level of their restoration, would be highly beneficial to their development and overall well-being. However, the majority of environment/behavior

and A.R.T. studies have included only adult populations (Taylor, et al, 2001) or older children (Björklid & Nordström, 2007).

Korpela, et al, (2002) found that children purposefully use preferred places for cognitive restoration and emotional regulation as early as ages 8 and 9. Children in this study were interviewed to discover the nature of their favorite places (natural/built, private/social) and the purpose of their visits there; results showed that the children used the spaces for recreation and social activities, for 'peacefulness' (p. 393) and emotional recovery from stressors, consistent with the use of a restorative space.

Holmes, et al, (2006), found that preschoolers' attention to classroom tasks was restored after outdoor recess breaks in their curriculum and that girls were more positively influenced than were boys. The question raised by this study, when viewed from an A.R.T. perspective, is whether it is the influence of the natural environment or the physical activity occurring there that is restorative to the children.

Trancik and Evans are among the very few researchers to investigate the effects of natural spaces on attention behavior in younger children; their study relied on parental feedback of the level of inattentive behavior exhibited by their children after engaging in recreational pursuits, such as rollerblading or playing on a computer. The authors evaluated the level of 'green-ness' of the environment in which the activity took place, then correlated reported attention levels to the amount of natural elements assumed to be in the physical space the recreation was engaged in. The participants in this study ranged from 7-12 years of age.

Kuo and Taylor (2004) also study the effects of green spaces with predominantly older children diagnosed with Attention Deficit/Hyperactivity Disorder (ADHD); the lowest age in their work so far has been five years, the average participant being 10-12 years old. They found that children who engaged in after school activities in 'green spaces' evidenced significantly lower symptomatology of ADHD than those whose activities occurred in more urban or less green spaces.

Minimal work has begun to explore with very young children (under age seven) the benefits or experience of interaction with plants, trees and natural, wild areas (Fjørtoft, 2001; Kuo & Taylor, 2004; Louv, 2005), though many of these still retain a low-end age of seven years for their participants. Fjørtoft (2001) found that children aged 5-7 years showed increased large-motor development and coordination when playing on a playground that featured more natural elements, such as trees and large stones for climbing, fields for running and shrubs for hide-and-seek. The experimental groups showed a statistically significant improvement over the control group "in balance and coordination abilities" (p. 38) as well as strength and some flexibility skills. Their findings suggest the complexity of the natural environment promoted increased physical play and activity, resulting in improved motor skills. Kuo and Taylor (2004) found in their ongoing studies that exposure to natural settings appears to consistently decrease attentional fatigue and restore attentional behavior among children. The more green-ness is present or the more natural the setting, the greater the effect.

Louv (2005) discusses the changing social attitudes toward allowing young children to explore the outdoors. He highlights the Kaplans' work (1995) in attention

recovery and the decreasing amount of time spent outside by the young, as well as the increase in ADHD and attention-related behavioral issues seen at home and in schools. He draws a strong correlation between these factors, strongly suggesting that the disappearance of unsupervised, unstructured play time outdoors could be at least partially responsible for the increase in behavioral problems our children exhibit.

Children may experience the first serious demands on their attentional capacity in the new environment of preschool; they are expected to remain in one place, at a desk, table or seat, for a given period of time. They are typically required to participate in group activities, such as “circle time” or to follow the explicit directions of a teacher (Posavac, Sheridan & Posavac, 1999). Very young children develop quickly, growing and exploring their environments as a normal stage of development. Their attention to the world around them could provide opportunity to benefit from having a potentially restorative space in their nearby environment to enhance their classroom attentional capacity.

The natural environment as an attention restoring device has yet to be fully evaluated as a way to assist very young children in refocusing their attention. Evidence has supported the theory that exposure to natural environments serves to restore attention to fatigued adults and, in some cases, adolescents; the use of these spaces for young children may serve to lessen the disruptive behavior exhibited by inattentive children in preschool environments.

### *2.5 Grounded Theory:*

Grounded Theory, as published in 1967 by Glaser & Strauss (Glaser & Strauss, 1967) is a means of analyzing a body of data as it grows, perhaps even changing a study as datum are gathered and information evolves. Rather than beginning with a hypothesis to be supported or rejected, one begins with an idea for a study and a method for accumulating data such as interviews, then sorts through the information to glean patterns in the responses. If one is using an interview or survey, early responses may indicate the need for further exploration of a developing theme; the researcher would then deepen questions along those lines to acquire further clarifying responses. As the responses are analyzed, one develops a theory, very general and applicable in multiple differing circumstances, from the accumulated data. The theory developed is then further tested with different samples, under varying circumstances to continually evolve the theories and increase their utility among researchers. They are grounded in the data from which they evolve, and the studies are shaped, in part, by the data as it is gathered. As some questions are answered, other, new research questions may come to light. A study can change halfway through, addressing more accurately the newly found information. Instead of being limited by the pre-study information and questions, as in a highly structured interview, it grows and expands, seeking deeper information in response to the progress already made. There is little to no statistical analysis, as the focus is on experience of the participant and describing it, rather than it being quantified. The techniques are used in psychology, sociology and other social sciences, where there may be an abundance of data in the form of interviews, anecdotes or other sources, but little in the way of established theoretical doctrine that is applicable to the situation under scrutiny. This approach gives deeper understanding

to the human side of the study, or the participants' perception of the stimuli and is highly valuable in understanding perception, conception and emotional responses.

Thus far, I have found no studies of very young children addressing the effects of exposure to views of natural environments on attention restoration, or their perceptions and experiences of such places. While very young children may have outdoor playtime in their daily curriculum, often the play areas are either heavily paved or are comprised of limited, semi-structured play areas shared with other children (Holmes, et al., 2006). Inclusion of natural areas may be neglected in the planning and design of preschool play areas and environments. Plants, shrubs and water features afford deeper fascination than an entirely built environment (Kaplan, 1995; Whitehouse, et al., 2001) and may result in a more relaxed, restorative experience for the child. Benefits of interaction with plants and flora have been documented in other settings, particularly in studies of children's gardens as well as healing gardens (Hartig & Cooper-Marcus, 2006; Whitehouse, et al., 2001), sometimes used in hospital settings to promote relaxation and restorative experiences for patients as well as staff (ibid).

Hartig and Cooper-Marcus (2006) discuss the need for clear definitions when conducting interdisciplinary research with the fields of medical and social sciences; that is, the need for exact definitions and rigorous evidence to support the link between health improvement, stress reduction and exposure to gardens and natural spaces. Whereas good subjective data from patients and staff regarding hospital gardens exists, more scientific research and the study of methods are needed.

From restorative gardens and virtual spaces to window views, whether engaging the elderly or older children, prior work has found supporting evidence for interacting with nature to increase attention restoration. This study sought to fill a void found in the research on exposure to natural environments pertaining to very young children and levels of immersion required for an effect.

## Chapter 3 Methodology

### *3.1 Overview:*

This chapter will discuss the definitions used, the sample population and methods used in this study. A brief discussion is included regarding the sample, the interview sessions, the materials used and the analysis used to interpret the data.

### *3.2 Definitions:*

In keeping with the advice of Hartig and Cooper Marcus, I sought to provide a clear set of operational definitions I created for this study. It is hoped that this will aid in clarifying specifics that are significant to this study. 'Very young children' referred to children aged 3-5.5 years old. 'Attention' referred to their ability to focus their concentration on the task at hand, in this case the maze tasks and discussing the view outside the window. This was demonstrated by working on and completing a given task without disruption. 'Patio garden' referred to a small area outside the classroom window inclusive of a bench and 17 potted plants, flowers, and shrubs of varying heights and in different stages of blooming.

### *3.3 Sample:*

The Old Mill Center (the 'Center') is a 501(c)3 non-profit preschool that provides educational services to both special needs and mainstream children; it is located in a small university community and provides preschool classes to a highly diverse population. The Center is located at the edge of a city park and has views of natural and built elements in the landscaping outside each of the classroom windows. The mission of the center is to help "children of diverse backgrounds maximize their

potential through specially designed education and therapy programs” (Old Mill Center, 2009). Due to a national economic downturn, the summer enrollment at the Center was down to just under half of their normal level. The participating classroom typically has 25 children enrolled each session; during the summer of this study, there were only 11 children enrolled. The children in the classroom were of varying cognitive and developmental abilities; none were known by the researcher to be ‘special needs’ children. Both genders were represented, as well as a diverse ethnic blend of Hispanic, Caucasian and Asian-descent children. Preschoolers at the Center range from 3-5.5 years of age; the participating children varied in age from 3 to 5 years, averaging 4 years of age. Participants needed to be able to converse in English; I followed the classroom teacher’s advice and guidance for children’s English fluency.

The participating children were predominantly Caucasian with one Hispanic girl. In the sample were 3 girls and 5 boys whose parents completed and returned the consent forms. More males than females returned consent forms, so there was an unequal gender spread in the participant population. Of these 8 children (73% of the classroom), 5 (63% of the sample) participated in all three conditions. Two (#1, ‘Sarah’ and #2, ‘Mark’) were withdrawn from the preschool halfway through the program (one week into the interview sessions) for family vacations; they completed Condition One, but missed the second and third. I have chosen to exclude them from further discussion as they did not participate in the pertinent portion of this study. A third child missed Condition Two, the Window intervention.

All students attended on differing days, so were available for study participation intermittently through the summer. One child exhibited shyness toward

the researcher in her classroom initially, but was willing to be interviewed; upon subsequent visits she demonstrated eagerness to participate, as did the remaining children. Several asked to 'play the maze game' repeatedly, beyond their allowed three visits. All of the children were able-bodied and showed no developmental delays or difficulties that would make it challenging for them to participate in the study. The following table presents each of the primary participants.

Table 1 Sample identification

Participant ID	Age (in years)	Gender
3 'John'	3	M
4 'Ted'	3	M
5 'Kara'	3.5	F
6 'Ian'	5	M
7 'Mason'	4.5	M
8 'Eva'	5	F

I was a graduate student at Oregon State University while conducting this study, with prior experience interviewing preschoolers regarding their preferences in preschool classroom and building environments.

### *3.4 Recruitment:*

Participants were recruited from an inclusive preschool classroom at the Old Mill Center. Preschool children at the Center were invited to participate in this study via informational packets sent home by their teachers. An informational packet regarding the study, including an Informed Consent document (Appendix D) and an Invitation to Participate document (Appendix E) were sent home with all English-speaking students in the preschool classroom. Parents had the opportunity to read the forms and sign their consent, then returned the forms with their child to the preschool center on a subsequent day. The children's classroom teacher and the Center Director

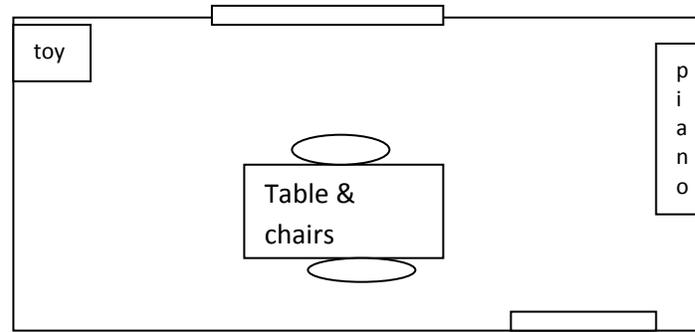
were well-briefed on the study, so were able to answer parent's questions and followed-up with parents, encouraging them to participate. The forms were gathered by the children's teacher and retrieved by the researcher. Interviews were scheduled to occur during the children's free choice time during the morning session, so as to not disrupt their learning.

### *3.5 Sessions:*

This study used a semi-structured interview technique in all three conditions, asking the children to perform a brief maze task (3 short mazes) and then to "rest", look out a window to a patio garden, or sit in the patio garden prior to completing three more mazes. I included behavioral observations as well as the verbal input from the children, seeking patterns in their responses to the conditions.

All sessions took place in a small classroom near the participants' regular classroom. It was a plain, small, white room with a window overlooking a small parking lot, a storage garage and a picnic area with a table and benches (see Patio Garden Layout, Appendix G). Occasionally there were small animals (squirrels, nutria) and birds near the preschool which appeared in view during the sessions. Across the parking lot were trees, grass and shrubs. Inside the classroom there were no decorations or boards on the walls; for the sessions, a small table and two chairs were provided. In addition to the interview table and chairs, it had a piano (the key lid was kept closed during the interviews) and a small plastic crate in a corner. Following is a diagram of the interview room; the window is to the top, the entry door is on the bottom.

Figure 1  
Interview room



Children whose parents returned signed consent forms were invited, individually, during unstructured free time in their classrooms to ‘play a game’ with the researcher. Each session lasted an average of 7-12 minutes, and each child was to participate in three sessions, at least 24 hours apart. Kuo & Taylor (2004) found children working in dyads or alone conducted activities with “more reliable effects” (p. 1583), suggesting the likelihood of fewer interruptions or interpersonal interactions that might disrupt the respondent’s reactions during the study.

In the first condition, the participants were shown a maze on paper to ensure they understood what it was and how to complete it. They were then given a set of three simple mazes to complete independently; this maze set was timed. They were then asked to sit quietly and ‘rest’ or relax for two minutes (Appendix A, Condition 1, Interview Script). Blinds over the window were kept at an angle to allow natural light in, but to exclude the view of the landscaping outside. Next, the participants were given a second set of mazes of equal complexity to complete. The length of time it took to complete each maze and the numbers of errors made were documented by the researcher. It had been intended for children who had difficulty using a crayon or marker to complete the maze to be allowed to trace the path through the maze with

their finger; this did not occur, as the children all found it more enjoyable and efficient to use a crayon while performing the maze tasks.

In the second condition, children were first given a set of three mazes to complete, then asked to look out the window and talk about what they saw (Appendix B, Condition 2 – Interview Script). Duration of viewing was two minutes; the children were asked to tell the researcher what they saw when they looked outside. If they did not wish to talk about what they saw, they were allowed to simply look out the window quietly. After viewing the scenery outside the window, the child was then asked to complete a second set of three mazes, of equal complexity to the first set. Their progress through both sets of mazes was again timed and errors documented.

In the third condition, the participants were given a set of three mazes to complete. They were then asked to go outside with the researcher to the patio garden outside the room to sit and 'rest' on a bench there for two minutes. See Appendix C, Condition 3 – Interview Script). While outside, the child was observed for signs of interest in, or interaction with, the plants and natural elements in the patio garden space. After the 'rest', they were escorted back into the interview room to complete the second set of mazes.

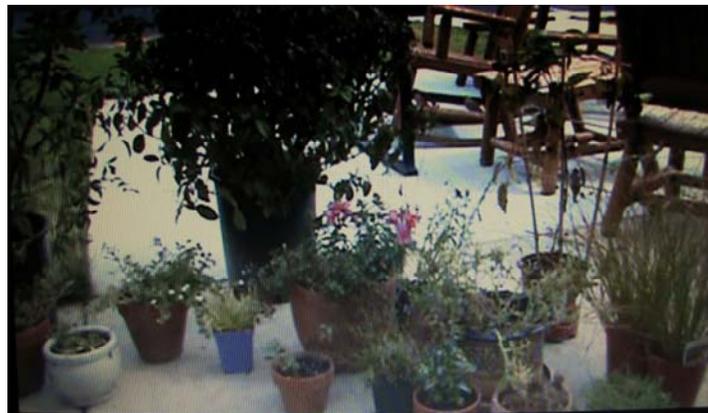


Figure 2 The Patio Garden

Upon completion of the second maze set in each condition session, each participant was given a black-and-white sticker with an insect picture on it that they colored in with crayons and kept as a reward. Any child who elected to end their participation without completion of the full session was also given a sticker for participating. The three conditions took place on a separate day for each child, with at least 24 hours passing between sessions; children were randomly assigned to start with the window, patio or closed eyes conditions for variance.

Comments and actions by the children and conversations were recorded for content analysis in all three conditions. The researcher made notes from both audio and video recordings and coded each of the participants' mazes. Each session was anticipated to take 7-10 minutes. Any child who expressed discomfort or anxiety during their sessions was escorted back to their classroom to return to their normal activities immediately. All transcriptions, audio and video recordings of the interview sessions, photographs (stills taken from the digital video images) and notes were maintained in a locked drawer in the researcher's office. Upon completion of the data analysis, all identifying records were shredded in the researcher's office.

### *3.6 Materials:*

Materials used by the researcher included audio and visual recording devices, a set of age-appropriate mazes, ranging in complexity from easy to medium, crayons for completing the mazes, a window with a view to the exterior of the preschool, and a variety of plants, both flowering and evergreen shrubs, perennial and annual flowers in pots on a patio with a small bench. Upon completion of data collection, all plants and

pots were donated to the Center for the continued enjoyment of the children and faculty.

Staats, et al, (2003) discuss the possible correlation between particular places and activities performed within as a potential confounder for prior studies; to avoid this, the window view included plants and trees the children were familiar with, but not a scene they would typically see out their classroom window, which looks out to their normal recess area.

The use of mazes in child research has documented ability to navigate a maze in children as young as two years of age (Blaut, Stea, Spencer & Blades, 2003) and their ability to comprehend barriers to movement as represented by the lines on a drawn maze (Hui, 2006). Mazes are also recommended for use in early childhood curricula to enhance spatial learning (Rettig, 2005). Hui (2006) demonstrated the ability of preschoolers to effectively navigate paper-and-pencil mazes while investigating the effect of listening to Mozart on spatial-temporal ability. The ability to successfully complete a maze requires attention to detail, understanding the concept of the barrier lines and the ability to attend to the task long enough to complete the puzzle.

### *3.7 Analysis:*

After concluding each interview I transcribed the audio and video recordings, noting key words indicating preference, avoidance or interest in the environment the participants were exposed to each condition. Children's comments and physical actions in each of the conditions, as they sat quietly, looked out the window or sat in

the garden were compiled and content analyzed, by group, for indications of reactions to and perceptions of the garden space. Responses (both verbal and physical) were analyzed for patterns, culminating in a list of categories based upon differing qualities or elements in the children's responses. I used notes written on Post-It stickers to create a visual 'map' of the responses based on frequency of occurrence, resulting in columns of similar responses or themes. Such topics included natural vs. built elements; animals/birds vs. plants/trees; and existing vs. imagined elements. Words indicating action ('play', 'climb', 'walk', and 'look') were compared to passive ('sit', 'hear' and 'see') activities, suggesting a perception of the natural environment as a place for both active and passive pursuits. Descriptive words ('peaceful' or 'quiet' as opposed to 'exciting') were noted for suggestions of a child's perception of the environment as potentially restorative. Physical activity was noted as active (exploring, touching) or passive (sitting, looking) and imaginative or non-imaginative. Also, range of exploration was examined, seeking patterns of close-up exploration vs. distal (viewing from the bench or another location) behavior.

### *3.8 Timeline:*

Recruitment and data collection sessions occurred daily Monday – Friday beginning in June; interviews began in early July and ended in August. Interview transcriptions were begun upon conclusion of most interview days; data analysis took four weeks, beginning immediately upon completion of data transcription.

## Chapter 4 Results

### *4.1 Overview*

This chapter will discuss the findings of the study, problematic areas in the protocols, my observations from the children's behavior and comments, and the themes which emerged from the data.

### *4.2 Behavioral Observations:*

The children were observed and video-recorded during their maze work and the intervening conditions. Physical behaviors differed from verbal behaviors, as demonstrated during the mazes when some would cross lines, but say they did not. Each responded differently during the conditions, as discussed below.

#### *4.2.1 Maze behaviors:*

During the first sets of mazes, as a group and in all conditions, the children enjoyed doing the maze tasks. They used crayons, selecting their own colors, and working quickly. One boy, Ian, narrated as he went ("My dad drives the car..."); in all sessions, Kara asked repeatedly "...which way I go?" as she worked, each time being prompted to 'do her best'. Each child described 'not jumping', indicating they understood the direction to not cross the lines, but several 'jumped' anyway, even as they said they did not. One boy, John, made circles on one of his mazes rather than tracing a path, announcing he was done as he stopped drawing. This occurred halfway through his sessions, demonstrating that he understood the maze intent, but chose to make his own design instead. Most said the mazes were easy, but not all; one child declined to do a second set during his second interview, saying they were "...too

hard..." Some sped through the mazes, making few mistakes; others lingered, going slowly and looking carefully, still making errors and turning down incorrect paths. One boy looked at the maze before beginning, seeming to be mapping out the path before 'beginning' with his crayon.

Some of the children spoke to the researcher during their mazes, which could have slowed their times; two declined to perform their second set of mazes after the interventions, so data was lost which could have revealed more information about their delayed reactions to the garden, view and the mazes themselves as directed activities.

Another child, John, had extreme difficulty each session sitting still, physically. He would get up between each set of mazes and walk around the room, looking out the window or at other things within the room. He exhibited the same behavior both in his normal classroom and on the recess play yard, so it is not a reaction to the novelty of the situation. Interestingly, this is the child who spent the most time looking carefully at each of the plants and engaging deeply with the dirt, pots, plants and insects in the garden outside. With the sole exception of his third condition experience, sitting in the patio, he was highly and consistently distracted in the sessions as well as in his classroom.

#### *4.2.2 Eyes Closed Behaviors*

When children were asked to sit quietly and 'rest' between maze sets, they quickly grew restless, and instead they explored the room. After a few seconds of sitting quietly, the children became restless. Participants did not want to close their eyes; I accepted their sitting quietly and replied briefly when they talked directly to me. Some were distracted by the closed piano in the room and wanted to play it; two

tried to play a few notes. In conversation, their focus seemed to remain on indoor activities and things within the room. Their comments were minimal. Table 2 provides examples of children's comments during their 'rest' break.

Participant ID	Responses/focuses while indoors
5 'Kara'	"...my sticker will be blue..." (before getting her sticker)
6 'Ian'	"I want to draw a bulldozer...but I don't know how..."
7 'Mason'	"I have an X-Box..." "...there were footprints in the maze..."
8 'Eva'	"I can play the piano..."

Their responses indicated no interest in the concealed view but showed intent of other activities they would like to do that pertained to the indoors (drawing, coloring, games). In fact the children did not pay any attention to the window at all during this session; they did not try to look out the blinds before, during or after the interview, even when some of them had been outside in an earlier condition. Upon resuming their second sets of mazes, as a group, they focused on the maze set itself and finished quickly. Analysis of their cumulative mazes revealed an equal number of increased and decreased errors and speeds among them.

#### *4.2.3 Window View Behaviors*

When the participants entered the interview room for their second condition, the window blinds were open, with a view of the garden area outside. None of them went directly to the window until asked to do so after their first set of mazes. When prompted to describe what they saw, they would most often list one or two things, then turn away. When asked if anything else was 'out there', they would return to the window and list more things. They did not seem interested as a group in the patio or the space beyond. Participants 1, 2 and 8 did not participate in the window condition.

Table 3 demonstrates the children's minimalist responses; they did not give full sentences, but listed individual items with pauses between each.

Table 3 Window View Responses

Participant ID	Window view responses
3 'John'	"Trees...cars...trees...grass..."
4 'Ted'	"...plants...Jill's car...chairs...a bike thing..." (bike rack)
5 'Kara'	"Trees...trees...a sun...orange and blue and green... (describing a parachute left on a nearby table)
6 'Ian'	"...flowers...trees...a car...a garage...a building..."
7 'Mason'	"...Jill's car...Jack the cat..."

They listed nouns, but gave no sign of potential activity or anticipation of space use.

The children's attention was evenly drawn by built and natural elements; they attended to plants and trees as well as the garage (building, "...maybe a school...") and one identified a therapy cat ("Jack") who 'works' at the Center and two identified a particular counselor's car. Some focused as much on built elements ("...Jill's car", a garage and a bike rack) as much as on natural (trees, flowers, etc.) The window ledge was high enough that a small step stool was provided for all children to have an adequate view outside. When they resumed their work on the mazes, they continued to work steadily with no remarkable changes in speed or errors.

#### *4.2.4 Patio Garden Behaviors*

As a group, the sample had a shared experience of gardening as an occasional classroom activity at a nearby community garden. This prior experience may have influenced their responses to the garden. They all participated in outside activities during class recess breaks, and seemed to enjoy their time outside, though in unexpected ways. During the patio intervention, children became much more physically active. Once outside, two chose to sit and play at a table or in a rocking

chair away from the garden; when asked if they would sit in the garden, one complied, the other wished to remain in the rocking chair "...in the sun..." Most of the children explored the garden space actively, looking at the plants, sitting on the bench, kicking at or playing in the dirt.

John, who had difficulty in each of the three conditions sitting still long enough to do his mazes suddenly quieted, fascinated by the leaves and the plants, asking for identification of nine of them. He touched each of them gently, pulled leaves off one, and studied each carefully, tracing the leaves and blossoms. One child became highly animated, taking the researchers hand and pulling her to the corner of the building to look around to see the class playground. He expressed wanting to "...show you my outside!" then continued to explore the new space of the patio garden and the surrounding area, including a birdbath, grassy area and the bike racks.

One child did not seem interested in the space, or in being outside at all. He walked outside, paced the garden restlessly for approximately 30 seconds and then sat briefly for 10 seconds. He got back up and continued to pace until returning back to the interview room. He did not express anxiety at being outside, nor did he verbalize any dislike for the space – he simply did not seem to care one way or the other about it.

One child, Eva, was initially sitting quietly on the nearby chair in the sun, then jumped up and ran to the bike racks to play on; swinging from them, running through the 'tunnel' they formed and hiding behind them.

Table 4 demonstrates the range of creative thinking, outdoor experience and interest in the environment the children exhibited. They wanted to know how the

space was used, talked about activities in similar areas they had experienced and expressed comfort and pleasure within it.

Table 4 Patio Garden Responses

Participant ID	Responses
3 ‘John’	“It got me...” (a slug) and “...where are my people?” and “I like it...”
4 ‘Ted’	“I’m a rocket and a boy...” and “I want to help this plant back up...”
5 ‘Kara’	“I like this pink flower...it doesn’t make me sneeze...it’s too strong for me to pick...” and “I like benches...”
6 ‘Ian’	“My garden is perfect but my pumpkins died...” and “this looks good...”
7 ‘Mason’	“Have you found any animals in here?”
8 ‘Eva’	“There’s a rock...what’s it for?” and “What do you do out here?”

*Note: six children completed their first sets of mazes and the patio time; two did not complete their second sets of mazes.*

Kara talked about her mother’s garden at home where they grew flowers together; Ian discussed his family’s garden plot in a nearby community garden, specifically the vegetables grown there and the people he would see when they went to work in their plot. Several of the children referred to a garden plot that the class would visit near the preschool and harvest some vegetables for their snacks; they appeared to enjoy this activity.

Once again, an equal number of increases and decreases in speed was exhibited by the four children who completed both sets of mazes (pre- and post-intervention) in this condition; two made fewer errors, one made no errors in either condition and one child showed an increase in errors.

Overall, I found that the two children who participated in all three conditions and completed both sets of mazes in each, both showed improvement (reduced errors) after sitting in the garden, that participant 6 showed improvement in all three conditions, but that participant 5 only showed improvement after the third (garden) intervention and increased her errors after the first two interventions (eyes closed, window). All children appeared to enjoy and for the most part prefer being outside to

inside; this is supportive of Louv's work (2005) in which he discusses children's preference for outdoor as a place to relax and take a break. They seem to become more imaginative and attentive to detail and experiences while outdoors; given that during their mazes they are more or less focused on the task itself, during their 'rest' times they were much more animated while out in the garden.

*4.3 Emerging themes:*

As the data unfolded and the responses clarified, the responses began to fall into different categories relating to perceptions of the outdoors, activity levels and functions of the space.

*4.3.1 Perceptions of the outdoors:*

For some of the children in this study, the outdoors was used as a place to play, explore and create. For other participants, it was described as a highly social space, where they work and talk, visiting with family and friends as they worked in their gardens. Table 5 gives an indication of their perceptions, including preference and enthusiasm to get outside. It reflects their heightened levels of physical activity as well as their engagement of the space.

Table 5 Responses to Outdoors

Participant	Verbal Responses
Kara	"C'mon, this way...", "Can I look at the plants?"
Eva	"Can I take my mazes out?"
Tommy	"I want to show you my outside..."
John	"Let's go outside..." (during Condition 2 after Condition 3)

Each had their own interpretation of the space, but until they were immersed in it completely, as opposed to viewing it through the window, it did not appear to be

perceived as a desirable destination or active place. It was perceived as functional, playful, and described as 'pretty' by a majority of the children only when they were actually outdoors in the space.

#### *4.3.2 Indoors vs. Outdoors:*

An interesting finding noted during qualitative analysis was the fact that until the children were actually in the garden/outdoor space, it did not seem to be perceived as a destination or place to go. Their responses, when asked to describe what they saw, were very flat – 'trees, bushes, flowers, a building/garage'...they would list the bicycle rack, but only as that, not as it was used later (a toy, a tunnel and a swinging structure) when they had access to it. Some of those who visited the garden early in their studies, or began with Condition Three asked to spend subsequent breaks in the space; one girl asked to take her mazes outside to do during her Condition 2 interview, the window intervention, after experiencing Condition 3. During the window condition, as a group they did not describe the garden area within their view as anything to play in, explore, sit in or touch. Responses were similar across all varying orders of Condition 3 exposure (first, second or last). I have not found any reference to this phenomenon in prior studies and believe that it should merit further investigation. If the outdoors is to be considered a 'restorative place' for the very young, we need to further understand how a space becomes a 'place' for the very young developing mind.

#### *4.3.3 Imaginative/Functional Space*

Once outside, the children played alone or with imaginary others ("I hear my friends" and "...that's my spaceship up there..." John, age 3) ("I hear my mom..."

Kara, age 4 ½) and (“I’m a rocket and a boy...” Ted, age 4). Eva, 5, played hide and seek behind the bicycle rack and rocking chair near the garden space, pretending she could not be seen behind the small objects while Ted played ‘Limbo’ with the bike racks and engaged in other imaginative play, being a ‘rocket boy’; John talked about having a spaceship which was floating above us outside. None of the girls mentioned any imaginary vehicles or activities.

Kaplan’s (1995) discussion of ‘awayness’, or the ability of a place to give a feeling of being away enough to separate from the daily activity, may be demonstrated by this playful activity. There, the children had separated enough from their classroom and the maze activities to play and create imaginary events or friends. They had successfully created their own sense of ‘awayness’; this depth of immersion may be adequate to create the restorative effects found in adults.

Some children described only limited, literal activities while seated in the garden or talked only about the plants that grew there or in their own gardens (“...there are strawberries...a pumpkin...”). These children did not expand on the given space or explore it as a place to play. While Kara talked about the flowers (“...it’s pink...it doesn’t make me sneeze...”), Ian talked at length about the garden his family has and what they grew there (“...punkins...strawberries...”) as well as the insect and wasp killers his dad used (“...my dad has wasp killer spray at home...”) Eva asked “What do you do out here?” demonstrating interest in the function of the space.

#### *4.3.4 Social Space:*

Ian (age 5) talked about his family's garden and the people there (“...friend in the garden...and we watered the plants...see people in the garden...”) Kara talked about her friend “...Arwen...will see me strong...” after talking about the plants being “too strong” for her to pick. John asked repeatedly “...where are my people?” and mentioned hearing his classroom friends calling him as well as his friends on the imaginary spaceship above us. Table 6 presents examples of some of the social interactions or expectations the children demonstrated while in the garden.

Table 6 Garden as Social Space

Participant ID	Responses
3 'John'	“Where are my people?” “My people are calling...”
5 'Kara'	“...Arwen is going to see me...”
6 'Ian'	“My family has a garden...” “...the people there...” “...they water the plants...”

Overall, findings were mixed; some participants appeared deeply engaged in the novel environment of the patio garden and the new view, investigating the new spaces, others ignored them (the garden as well as the view). Once outside, some children interacted directly with the plants (“What's this? What's this one?”), particularly John, a 3-year old who touched every plant and spent a majority of his garden time watching and talking about a slug; two others virtually ignored the garden space, playing instead on a nearby bicycle rack “...I can go under this...” or pacing the sidewalk. One of the children, Ian, had gardening experience already, having worked with his mother in a family garden plot in the nearby community garden. He discussed the pumpkins, strawberries and other plants they had grown that season, the bugs that had eaten their berries, and how the sun and soil help plants grow “I got a garden with strawberries...I like them...that bug ate my strawberries...that silly bug...” Ian also wished for his binoculars so he could “...watch the birds flying...”

nearby and talked about his father using insect and wasp killer at home when he saw a wasp on the camera lens as we talked (“there’s a bee” and “...we got a mouse killer – a mouse box...it goes ‘Beep! Beep! Beep!’...””) Interestingly, this boy showed decreased errors on his mazes after viewing and sitting in the garden space, but took longer in each condition to complete his mazes (9-19 seconds longer) suggesting some improvement in error avoidance, and more time paying attention to the maze itself, finding the correct pathway.

John was particularly interested in the plants, touching every one, feeling the textures of each and spending time rearranging the pots. He sat quietly on the bench, touched and kicked the dirt, talked quietly about the plants, asking the names of nine of them and only showed signs of inattention in the garden when he heard voices from inside the building, near the end of the garden visit. During his window viewing he had difficulty attending to the view and instead expressed interest in the piano, a toy, and talked to the interviewer about the other students in his class (“...where are my people?”) This child had extreme difficulty in correctly completing the mazes in all three conditions; he verbally expressed understanding of the directions but ‘shortcut’, or jumped lines on every one. During classroom observances he showed difficulty sitting quietly in circle and table tasks and was barely able to remain in his seat for the few seconds he spent on each set of mazes.

The other boys were interested in the plants, insects and cars in the nearby parking lot, several identifying a particular car as one belonging to the staff, “...I see Jill’s car...”

The two girls who spent time in the garden, ages 5 (Eva) and 4 (Kara), had different results; Eva wanted to sit on a chair "...in the sun" and played hide and seek behind a bicycle rack and chair while Kara discussed how the sun helped the plants grow. She also stated that the petunia "...doesn't make me sneeze..." and was "...too strong for me to pick..." The children seemed to be, each in their own ways, fully immersed in the outside environment, whether by playing, talking or exploring. Their interactions with the elements, both built and natural, provided evidence that they were not only engaged, but that the environments supported their intentions fully (Kaplan's (1995) 'extent' and 'compatibility').

#### *4.3.5 Attention Measures:*

It came to my attention that perhaps time spent completing the maze is not the best attention measure, but rather how long the participants persist in working the mazes combined with error reduction. One child (discussed above) showed increased time working the maze, but reduced his errors, suggesting that after the interventions he was better able to slow down and pay more close attention to the task, completing it more accurately. Observing the participants working on the mazes, it was clear that some of them were spending more time studying them; they were slowing down, looking ahead and problem-solving the mazes, rather than just racing through them. One of the children in particular, an older boy, was looking at the maze carefully before 'beginning' it, seeing how to solve it before setting crayon to paper (the start of timing the maze) making his recorded time scores inaccurate if assumed to be the only time spent solving the maze. Still another child was careful to go through every single path on the maze, including incorrect routes, attentive to ensuring she had drawn on

every single path. She demonstrated more attention to filling in every space on the maze more than doing it per her instructions.

*4.3.6 Natural/Built Elements*

Evidence was provided that children seemed to attend to more natural than built elements in a scene. In all, there were 58 occurrences of natural elements noted or mentioned, while built elements were noted 33 times. In this analysis, “natural elements” includes plants, trees, grass, birds, and insects. “Built elements” include bike racks, benches, buildings, a brightly-colored parachute and a garbage can. Six of the 8 children gave input in at least one full condition, either window or patio; the 2 children (Sarah and Mark) who did not participate fully did not take part in Condition 2 or 3. Whether looking out the window or sitting in the garden, the children were still drawn to some built elements, such as the garage, but predominantly focused on the plants, trees and other living things. Table 7 lists the categories considered for the analysis and the distribution of the responses given during the intervention conditions.

Table 7 Built vs. Natural Elements

Participant	Animal	Bird	Plant	Pots	Vehicles	Buildings	Other
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	10	0	18	4	3	1	3
4	0	0	2	1	2	5	0
5	0	1	5	0	0	1	3
6	3	1	6	0	2	5	2
7	1	0	5	0	1	2	0
8	0	0	0	0	0	3	0

The children’s interactions with the built elements items were interesting. One child (Eva) played hide and seek on and behind a nearby bicycle rack, another played limbo with it, moving under the curved arches of the rack. Eva preferred to sit at a

table and chair nearby rather than on the bench in the garden. Several asked to see the facility's nearby garage; many commented on a staff member's car parked in the lot near the garden.

#### *4.3.7 Attraction/Avoidance:*

Some of the children engaged the garden quite deeply, investigating dirt, insects, flowers, leaves and stems; others did not want to get 'dirty'. Children's comments on the space ranged from friendly and preferential ("This is pretty...", "This is nice...", "I like this...") and described the flowers and shrubs as 'pretty' and 'nice', to avoidance ("I want to sit in the sun over here"; "Can we go back in now?") Not one verbally expressed dislike for the garden or the outdoors as a whole. Louv's work (2005) depicting the outdoors as a natural and enjoyable environment for children was fully supported by all the children's responses. Whether sitting on chairs or examining plants and creatures, all the participating children appeared to find the patio garden and the surrounding spaces to be attractive and enjoyable as evidenced by their words.

#### *4.3.8 Active/Passive:*

One girl talked about a shrub branch "attacking" her when it brushed her back as she sat on the bench. A boy was acted upon; both the plants and a slug "...got me..." when he brushed against a shrub and saw a slug. He explored, dug, stroked and watched, talking to the plants, insects and himself. Some children played on the bike rack, a chair or bench and around the plants and dirt. One girl in particular, Kara, seemed to enjoy the outdoors but in a passive way; she talked about a flower being "...too strong for me to pick..." and that "...it doesn't make me sneeze..." It seemed

the environment acted upon her, rather than her having influence on it. Eva, aged 5, spoke of a sprinkler that "...got us..." at the classroom playground – these children seem to be mixed passive and active agents in their experiences outside.

None actively showed signs of dislike for the outdoors, but enjoyment; when it was time to go in, most of them walked a little more slowly than they did going outside. This could be a reflection of preference for an outdoor 'break' or the environment itself. Without further, more direct questions, it would be difficult to discern. The children demonstrated a wide range of reactions to the spaces, inside as well as outside. They enjoyed completing the mazes and while they all expressed that they understood the directions, they did not all adhere to them entirely. Their verbal responses gave the most insight into their perceptions of the outdoors; they shared their thoughts and prior experiences freely whether exploring or relaxing.

## Chapter 5 Discussion

### *5.1 Overview:*

This study encountered some conditions that may have limited or influenced the data as well as produced some findings I feel are worth further pursuit and clarification. It may be that simply having a view of the outdoors is inadequate to the task of attention restoration for very young children. In this sample, it appeared that their perception of the garden as a space and their reaction to it was very different than that which would be anticipated of adults. This may affect the potential restorative effect if it is relied on as a view rather than as an immersive experience. This chapter discusses the study's limitations, the emerging themes discovered in the analysis, and recommends further exploration of the topics at hand.

### *5.2 Limitations*

As the study progressed, I found myself facing conditions that may have unduly influenced the course of the study. Participants were interviewed in the morning, Monday through Fridays, from 10-11:15 a.m. as the children were available. The interviews were performed during the summer; the extreme heat of some days while the children were outside may have influenced their level of physical activity and interest in looking at or being in the garden. On five days of the interviews, the outside temperature was above ninety-five degrees.

The room that was used for the sessions had a piano with the keys covered, which drew the attention of several participants. Some wanted to play on it; others

simply asked why it was there. Another corner had a small crate of files and a toy on top; one participant tried to play with the toy, but set it down when requested.

The garden was an impermanent area for this study, needing to be removed each day and set up each morning for the interviews. A more permanent garden may have evoked different responses. Also problematic was the location; a clear view of the parking lot and a nearby garage were clear distractions to the potentially restorative effects of the space.

The sessions consisted of interviewing each child, having them complete the first set of mazes and then exposing them to the conditions, 'resting', gazing out a window to the garden, or sitting in the garden. They then returned to the second set of mazes and received their insect sticker upon completion of the set and were returned to their classroom. The interviews consisted largely of prompts, such as "Can you tell me what you see out the window?" or "What do you like best out here?" Children's responses ranged widely from boredom "How long will this take?" to eagerness to get outside as demonstrated by tugging the researcher's hand toward the exit and saying "C'mon, this way!"

It became clear that my perception of attention, that of speeding up during the mazes, may have been inadequate. Watching the children work on their mazes, it became clear to me that some participants spent more time working on getting their paths correct and worked more slowly and methodically. Some worked the path out mentally, their eyes looking over the maze before they began with the crayon. Timing was started when they set their crayons to the page rather than when they began to plan their routes; this may have skewed their times significantly.

Statements made during their maze tasks often reflected their thinking and mental processing as they worked. One boy in particular narrated his efforts, saying "...my father drives the car..." as he worked, turning the 'car' (crayon) as he progressed through the maze, turning right and left and ending "...at home..." when he reached the final point. One child would stop to ask if she was right on some turns; the researcher prompted her to 'do her best'. One child stopped entirely between mazes to try to converse with the researcher. The researcher responded briefly to try to keep the children focused on their maze work and minimize distractions. Only one child began her set of mazes prior to being asked to start, the others all waited for a prompt to begin, actively engaged their mazes and verbally expressed their reactions to the garden and view. Each received their bug stickers and colored them in; two children asked for more than one sticker. Most of the children chose to wear their stickers on their shirts. Two children expressed desire to return to their classroom prior to completing their second sets of mazes during their sessions; each was returned promptly after receiving and coloring in their stickers.

### *5.3 Emerging themes*

It became clear to me that the participating children enjoyed the outdoor space as a destination once they had the opportunity to be in it; until then, they paid little attention to it. They seemed to demonstrate a clear preference for, or interest in, natural elements rather than built; how this may apply to Attention Restoration Theory in terms of natural environments needs further investigation. Children's responses were different from those of adults participating in similar research based on ART

theory. Rather than simply sitting and relaxing, they were more physically active. I would suggest that in research with children, this level of physical activity is difficult to separate out in context of outdoor spaces and in the analysis of restorative effects. Indeed, it may very well be unnecessary to include an area strictly for sitting quietly in an outdoor environment for this age group if restoration is what is sought.

The indoor and outdoor experiences seem to be very different; when indoors, the children focused on things that pertain to the interior alone; when outdoors, they were focused on that. The two environments are very different and are perceived as such by the children. There was little to no anticipation or perception of the potential of a space until they were immersed within it, though once they had experienced it, they showed preference for it. The less structured the environment was, such as the wider, more open outdoor area, the more physically active and imaginative they became. Those with less prior exposure to a garden space seemed to perceive it as more active, and became more passive themselves, acted upon by the area and things within it. Those who described having gardens at home talked more of the functional space of the garden than those who did not describe or talk about home gardens. This may be typical of early child development; as they become more familiar with a previously novel environment and gain control over it, they may very well become more comfortable and physically active in it. This would certainly affect their perceptions of the space given them, and influence the design thereof. This particular concern should be addressed in further work, differentiating further between familiar and unfamiliar outdoor spaces as potentially restorative areas.

#### *5.4 Conclusion:*

My research provides insight into the perceptions and responses of preschool children to differing levels of exposure to a patio garden, a space intended to provide a restorative space between attention-intensive tasks. While they all expressed enjoyment of the space once immersed in it, they gave little attention to it otherwise. Prior research on restorative spaces for adults has implied that simply viewing a green space may be adequate to provide the desired effect; this study suggests that outdoor spaces are not attended to by preschoolers without direction. My findings revealed that simply having the space visually available was not adequate, nor did the children find it particularly interesting, not enough to attend to it for any length of time.

Attention Restoration Theory recommends a space that provides 'awayness' – I suggest that children this age have the potential to create that level of immersion through their natural use of imagination and apply it to any space they are in. The children of this study demonstrated an inclination to play, wherever they were, whatever they had available.

The participants showed a definite awareness of natural vs. built elements, and provided a more detailed listing of those, supporting work by Louv (2005), Kaplan (1995) and Korpela, et al (1996, 2002), demonstrating that perhaps there truly is a preference among all age groups for natural elements in our environments. To provide a pleasing, aesthetic space for children, this would indicate a need to include more natural design, such as flowers, shrubs and green spaces. Based on the level of physical activity witnessed among the children, I would also include plenty of open space for them to run and play their own games.

The data gathered in this study did not answer all the questions I had sought to resolve, but added to the body of evidence with more questions. It appears that children perceive outdoor space differently than adults do, at least from an indoor perspective. Restorative effects were not noted as a substantial effect in any of the conditions, and the very small sample size prohibits any generalization to any group whatsoever. While all the children appeared to enjoy the outdoors, and several showed enthusiasm while outside, the nature of their enjoyment may very well be physical rather than mental; any emotional recovery may be due to the release of stress as they run, play and explore rather than any green effects. Questions arose from the data that bear further investigation: Did the prior gardening experience these children share influence their responses to the garden area and interest in it? Would children accustomed to a less 'green' environment respond more strongly to having a patio garden available to them? Would children of greater ethnic diversity respond similarly to this sample, or would they require an even more varied garden setting to experience interest and restoration in it?

Those studying children's behavior, particularly the very young, know how challenging it can be to gather data from them, however as I have demonstrated here, it can be done. The researcher must take into consideration the limited attention spans of young children as well as their widely varying abilities in any study.

Researchers interested in exploring outdoor environments with the very young will find it a rewarding pursuit, filled with enthusiastic participants. As the body of research pertaining to preschooler environments and their learning, attention and recovery styles expands, so will the need for theories addressing this age group in

order to obtain the most accurate information possible. An expanse of knowledge and accepted literature regarding restorative effects for adults is available, but it must be re-conceived based on the very different perceptions and responses of children for those seeking to apply it to real-world environments.

#### *5.5 Recommendations for Future Work:*

A number of improvements originate from this study; beginning with a stronger Grounded Theory approach to determining children's perceptions of the outdoors and how it may be applicable to future research in restorative environments for children is needed. Rather than beginning with expectations and preconceived notions of what children think and feel, it is valuable to listen to them first, ask them for clarification and find meaning from there.

A theoretical framework applying early child development concepts more directly to environmental psychology and the design of children's environments must be further expanded. Current studies in environmental psychology approach the participation of very young children with trepidation; it is felt by some researchers that children this young cannot express themselves adequately. I see a need to increase the participation of this particular age group and to incorporate developmentally appropriate measures and interviews for them when researching topics that could affect their immediate environments. This will facilitate overcoming adult perceptions of what changes may best suit children's particular needs for comfortable environments.

A comparison of ethnic groups may reveal differences between cultural exposures and attitudes toward natural environments. Children with greater experience gardening in the form of chores may not be as interested in a novel garden; conversely, they may be more deeply affected by it, assuming it is a pleasurable experience at home. The age span of the sample was small, but the developmental differences between a child of 3 years and one of 5 years of age may show an effect between the levels of any potential restoration or perception of the spaces provided.

This area of research holds great potential in providing environments for the very young that may help to assist in attaining and/or restoring their attention in a holistic way, but to do so it needs to push the boundaries further and obtain more children's voices, perceptions and experiences in doing so.

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## Appendix A – Condition 1 Interview Script

**(Condition 1 – Window intervention)**

Before beginning, have age-level maze and crayons ready to go. Have voice and video recorders ready to record.

***In classroom:***

Researcher: Good afternoon, (name). My name is Deb. Are you having fun today? I would like you to come play some games with me – I have some mazes to do, and I think you might have fun doing them. Would you like to come with me to the next room to see them?

*If no:* Okay, maybe we can play later.

*If yes:* Okay, let's go. (*Walk student to maze room*)

***In maze room:***

Okay, have a seat here – here is an example of the mazes I would like for you to do. Have you done any mazes like this before? (*Demonstrating on example*) Do you see here, where you begin? This is a pathway to follow, to get to the end of the maze – can you see how to follow the pathway without crossing any lines? Would you like to use your finger to point the way, or a crayon to draw the path? There are three for you to do. As soon as you finish the first one, go and do the second one, and then the third. Okay, are you ready to start? Go. (*Begin timing*)

(*After the first set of mazes task, end timing*)

Good job, you did that well, (name). Okay, let's take a break for a couple of minutes and look out the window. Would you like to tell me what all you see out there?

(*Returning to maze task*)

Okay, are you ready to do another set?

*(If **yes**, return to table, set out second set of mazes) Are you ready? Go. (**Begin timing**)*

*(If **no**) Do you want to do another?*

*(If **no**.) Okay, let's go back to your classroom. But first, I have a special sticker for you, as a reward for helping me. Thanks so much for your help with the mazes, I really appreciate your help.*

*(After completing second set of mazes, end timing) Okay, you did that really well. Thanks so much for helping me with these – did you have fun? Before you got back to your classroom, I have a special sticker for you, to thank you for helping me. (**Show black and white stickers**)*

Would you like to choose one? You can color it in, just the way you want to.

*(After participant chooses sticker) Okay, thanks again for helping me today, (name) – I will walk you back to your classroom so you can go back to your activity.*

*(Videographer stops recording after we exit.)*

## Appendix B – Condition 2 Interview Script

**(Condition 2 – Garden patio intervention)**

Before beginning, have age-level maze and crayons ready to go. Have voice and video recorders ready to record.

***In classroom:***

Researcher: Good afternoon, (name). My name is Deb. Are you having fun today? I would like you to come play some games with me – I have some mazes to do, and a little patio garden for you to sit in. Would you like to come with me to the next room to see them?

*If no:* Okay, maybe we can play later.

*If yes:* Okay, let's go. (*Walk student to maze room*)

***In maze room:***

Okay, have a seat here – here is an example of the mazes I would like for you to do. Have you done any mazes like this before? (*Demonstrating on example*) Do you see here, where you begin? This is a pathway to follow, to get to the end of the maze, here – can you see how to follow the pathway without crossing any lines? Would you like to use your finger to point the way, or a crayon to draw the path? There are three for you to do. As soon as you finish the first one, go and do the second one, and then the third. Okay, are you ready to start? Go. (*Begin timing*)

(*After the set of mazes task, end timing*)

Good job, you did that well, (name). Okay, let's take a break for a couple of minutes and see the patio garden. (*Walk with child to the patio garden, sit quietly for two minutes. Let child lead conversation. If child does not speak, ask if they like the*

*space.*) Okay, was that nice? Would you like to go back and do a few more mazes?

*(Returning to maze task room)*

*If yes:* Okay, are you ready? Go. *(Begin timing)*

*If no:* Okay, would you rather go back to your classroom? *(If so, return child to classroom.)* Okay, let's go back to your classroom. But first, I have a special sticker for you, as a reward for helping me. Thanks so much for your help with the mazes, I really appreciate your help.

*(After completing second set of mazes, end timing)* Okay, you did that really well.

Thanks so much for helping me with these – did you have fun? Before you got back to your classroom, I have a special sticker for you, to thank you for helping me. *(Show black and white stickers)* Would you like to choose one? You can color it in, just the way you want to.

*(After participant chooses sticker, or if participant declines sticker)* Okay, thanks again for helping me today, *(name)* – I will walk you back to your classroom so you can go back to your activity.

*(Videographer stops recording after we exit.)*

## Appendix C – Condition 3 Interview Script

**(Condition 3 – Closed eyes intervention)**

Before beginning, have age-level maze and crayons ready to go. Have voice and video recorders ready to record.

***In classroom:***

Researcher: Good afternoon, (name). My name is Deb. Are you having fun today? I would like you to come play some games with me – I have some mazes for you to do. Would you like to come with me to the next room to see them?

*If no:* Okay, maybe we can play later.

*If yes:* Okay, let's go. (*Walk student to maze room*)

***In maze room:***

Okay, have a seat here – here is an example of the mazes I would like for you to do. Have you done any mazes like this before? (*Demonstrating on example*) Do you see here, where you begin? This is a pathway to follow, to get to the end of the maze, here – can you see how to follow the pathway without crossing any lines? Would you like to use your finger to point the way, or a crayon to draw the path? Okay, are you ready to start? There are three for you to do. As soon as you finish the first one, go and do the second one, and then the third. Go. (*Begin timing*)

(*After the first set of mazes task, end timing*)

Good job, you did that well, (name). Okay, let's take a break for a couple of minutes and rest. Would you like to close your eyes and sit quietly to rest for a couple of minutes? (*Sit quietly for two minutes.*) Okay, was that nice? Would you like to do a few more mazes? (*Returning to maze task.*)

*If yes:* Okay, are you ready? Go. (***Begin timing***)

*If no:* Okay, would you rather go back to your classroom? (***If so, return child to classroom.***) Okay, let's go back to your classroom. But first, I have a special sticker for you, as a reward for helping me. Thanks so much for your help with the mazes, I really appreciate your help.

(***After completing second set of mazes, end timing***) Okay, you did that really well. Thanks so much for helping me with these – did you have fun? Before you got back to your classroom, I have a special sticker for you, to thank you for helping me. (***Show black and white stickers***) Would you like to choose one? You can color it in, just the way you want to.

(***After participant chooses sticker, or if participant declines sticker***) Okay, thanks again for helping me today, (*name*) – I will walk you back to your classroom so you can go back to your activity.

(***Videographer stops recording after we exit.***)

## APPENDIX D

## INFORMED CONSENT DOCUMENT

Project Title: The Impact of the Natural Environment on the Attention of Young Children  
 Principal Investigator: Marilyn Read, Design & Human Environment Department  
 Co-Investigator(s): Deborah Upington, Graduate student researcher, Design & Human Environment Department

**WHAT IS THE PURPOSE OF THIS STUDY**

Your child is being invited to take part in a research study designed to determine the effect of viewing a natural scene, sitting in a natural setting, or sitting quietly, on a child's attention to a task. We propose that young children's attention will be improved after taking a brief break between attentional tasks to sit in an outside natural environment. Findings will be used in a graduate student's Master's thesis. Findings may additionally be presented at future conference proceedings and published in professional journals. We are studying this because the increasing work with children and environments is still largely driven by adult reactions to an environment, rather than children's reactions. Specifically, we seek to learn if sitting in or viewing a natural space may enhance a young child's ability to pay attention to a task.

**WHAT IS THE PURPOSE OF THIS FORM?**

This consent form gives you the information you will need to help you decide whether your child should participate in the study or not. Please read the form carefully. You may ask any questions about the research, the possible risks and benefits, your rights as a volunteer, and anything else that is not clear. When all of your questions have been answered, you can decide if you want your child to be in this study or not.

**WHY AM I BEING INVITED TO TAKE PART IN THIS STUDY?**

Your child is being invited to take part in this study because he or she is enrolled at the Old Mill Center in Corvallis, the location for our study. We will be interviewing children 3-5½ years old, who are currently enrolled at the Center.

**WHAT WILL HAPPEN DURING THIS STUDY AND HOW LONG WILL IT TAKE?**

During the study, there will be three interviews with each child in a small classroom near their regular room. In the first, we will ask children 3-5½ years of age to complete a set of three mazes on paper, using a crayon or their finger to trace a path, then to look outside a window to a patio garden for two minutes. They will be invited

to talk about what they see, and then asked to perform a second set of three mazes. In the second interview, they will be asked to complete a set of three mazes, then to take a short break of two minutes to sit outside the classroom in a patio garden, then to return to the room and complete a second set of three mazes. In the third interview, the children will be asked to complete a set of three mazes, then take a short break of two minutes to rest, then to complete a second set of mazes. Each maze will be discretely timed, and the child's completion times compared during data analysis to discern any differences between the different interview conditions for each child. After completing the second set of mazes in each interview, each child will be given a sticker to color in and keep in thanks for their participation. Those who do not complete the entire interview will also be given a sticker for their time. Children enrolled in the participating classroom who are unable to participate in the study due to lack of parental consent, language barriers or inability to complete the maze task will also be given a sticker to color and keep.

The interviews will take place in an interview room at the Old Mill Center during free choice play activity times and take 7-10 minutes. During the interviews, the children will be audio-recorded on a tape recorder and video recorded by the researcher, who will maintain the recordings in a locked file cabinet when not being used or transcribed by the researcher. All materials, written and audio, will be destroyed three years after the completion of this study. If you agree for your child to take part in this study, your child's involvement will last for approximately 7-10 minutes.

### **WHAT ARE THE RISKS OF THIS STUDY?**

There minimal risks to participating in this study.

### **WHAT ARE THE BENEFITS OF THIS STUDY?**

You and/or your child will not benefit from being in this study. However, we hope that, in the future, other people might benefit from this study because the information will be disseminated to the design community for reference in planning future preschool and childcare settings to engage children's attention. There is evidence in environmental design research that supports the use of natural spaces and gardens to restore attention among adults and older children; there are no studies as of yet that have explored this effect in very young children (under age five). This study seeks to fill that gap.

A follow-up letter will be sent to all interested parents of participants with information about the findings. No child will be identified in the letter or in dissemination to the design community; any specific quotes will be cited to a child by using a fictitious name; their correct age and gender will be identified (i.e. "*Becky*, 4-year old female").

### **WILL I BE PAID FOR PARTICIPATING?**

You will not be paid for your child participating in this research study. Any child participating in this study or enrolled in the participating classroom will be given a sticker to color in and keep.

**WHO WILL SEE THE INFORMATION I GIVE?**

The information your child provides during this research study will be kept confidential to the extent permitted by law. To help protect your child's confidentiality, we will use participant initials and identification codes for cross-reference rather than student names on the forms. All forms will be kept in locking file cabinets during storage. The children will be video – and audio-recorded for later review; these tapes will also be kept secured. Only the principal investigator and researcher will have access to them for analysis.

Recorded and written materials will be kept secured for a period of three years after completion of the study. If the results of this project are published, your child's identity will not be made public.

**DO I HAVE A CHOICE TO BE IN THE STUDY?**

If you decide allow your child to take part in the study, it should be because you really want to volunteer. Your child will not lose any benefits or rights he or she would normally have if he or she chooses not to volunteer. Your child can stop at any time during the study and still keep the benefits and rights you had before volunteering. If you decide not to take part in this study, your decision will have no effect on the quality of services your child receives.

Your child will not be treated differently if he or she decides to stop taking part in the study. Your child will be free to skip any tasks that he or she would prefer to not do. If you choose to withdraw your child from this project before it ends, the researchers may keep information collected about your child and this information may be included in study reports.

**WHAT IF I HAVE QUESTIONS?**

If you have any questions about this research project, please contact: Marilyn Read at (541) 737-0982, or email Marilyn Read@oregonstate.edu or contact Deborah Upington at (541) 753-4146, email upingtod@onid.orst.edu.

If you have questions about your rights as a participant, please contact the Oregon State University Institutional Review Board (IRB) Human Protections Administrator, at (541) 737-4933 or by email at [IRB@oregonstate.edu](mailto:IRB@oregonstate.edu).

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Your signature indicates that this research study has been explained to you, that your questions have been answered, and that you agree for your child to take part in this study. You will receive a copy of this form.

Participant's Name (printed): \_\_\_\_\_ Age: \_\_\_\_\_

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(Parent/Guardian's name printed ) (Signature of Participant's Parent/Guardian) (Date)

## Appendix E

**Invitation to Participate**

Researchers in the Design & Human Environment department at Oregon State University are exploring the issue of viewing or being in natural environments to restore a child's attention to a task. Current research into the area of restorative environments has been done largely from an adult's perspective, without considering the possibly very different perceptions and responses of children. This study is designed to specifically focus on children's responses.

A graduate student researcher will be coming into your child's class at the Old Mill Center over the next two months to interview children. The children will be asked to participate in three sessions. In the first, he or she will complete a set of three mazes, look outside a classroom window at a patio garden and talk about what they see for two minutes, and then complete a second set of three mazes. In the second interview, he or she will complete a set of three mazes, visit a patio garden outside the room for two minutes, and then complete a second set of three mazes. In the third interview, he or she will complete a set of three mazes, sit quietly to rest for two minutes, and then complete a second set of three mazes. Each child's maze tasks will be timed, then the results analyzed to determine if viewing the patio garden directly or sitting in it makes any difference in their ability to pay attention to the maze tasks.

The interviews will take place outside the child's classroom in an interview room just down the hall, during the child's free choice time. The interviews are expected to take approximately 7-10 minutes each and will consist of the researcher and the child sitting at a small table while the child works through the mazes, looking out the window together or sitting in the patio garden, then returning to the table for the child to complete the second set of mazes. Each child will be interviewed three times, with at least 24 hours passing between the interviews. Upon completion of the second set of mazes in each interview, the child will be given a sticker to color in and keep as thanks for their participation. Any child who appears to be uncomfortable with the procedure or with the researcher will be returned to their classroom to return to their activity and given a sticker. The children will be supervised at all times.

For children who are not enrolled in the study due to lack of parental consent, language barriers or inability to perform the maze tasks, there will be a classroom activity with one of their teachers, asking them to describe what they see out the windows, and what they do outside to relax. Upon completion, they will each receive a sticker to color and keep.

We will be sending out an informed consent form; if you are interested in having your child participate, please sign the consent form and return it with your child to the Center within two weeks. If you have any questions about this research project, please contact: Marilyn Read at (541) 737-0982, or email Marilyn

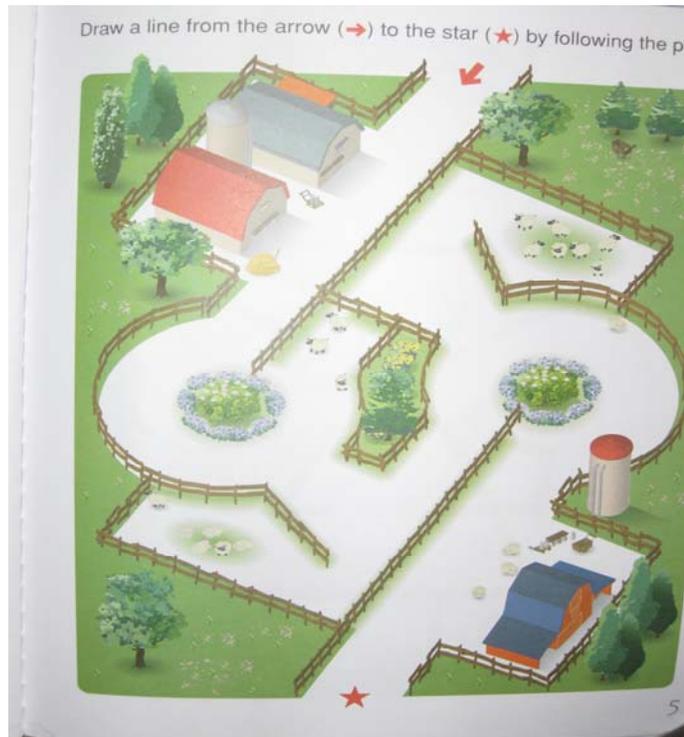
Read@oregonstate.edu or contact Deborah Upington at (541) 753-4146, email  
upingtod@onid.orst.edu.

We look forward to working with your child and appreciate their special input  
into this project.

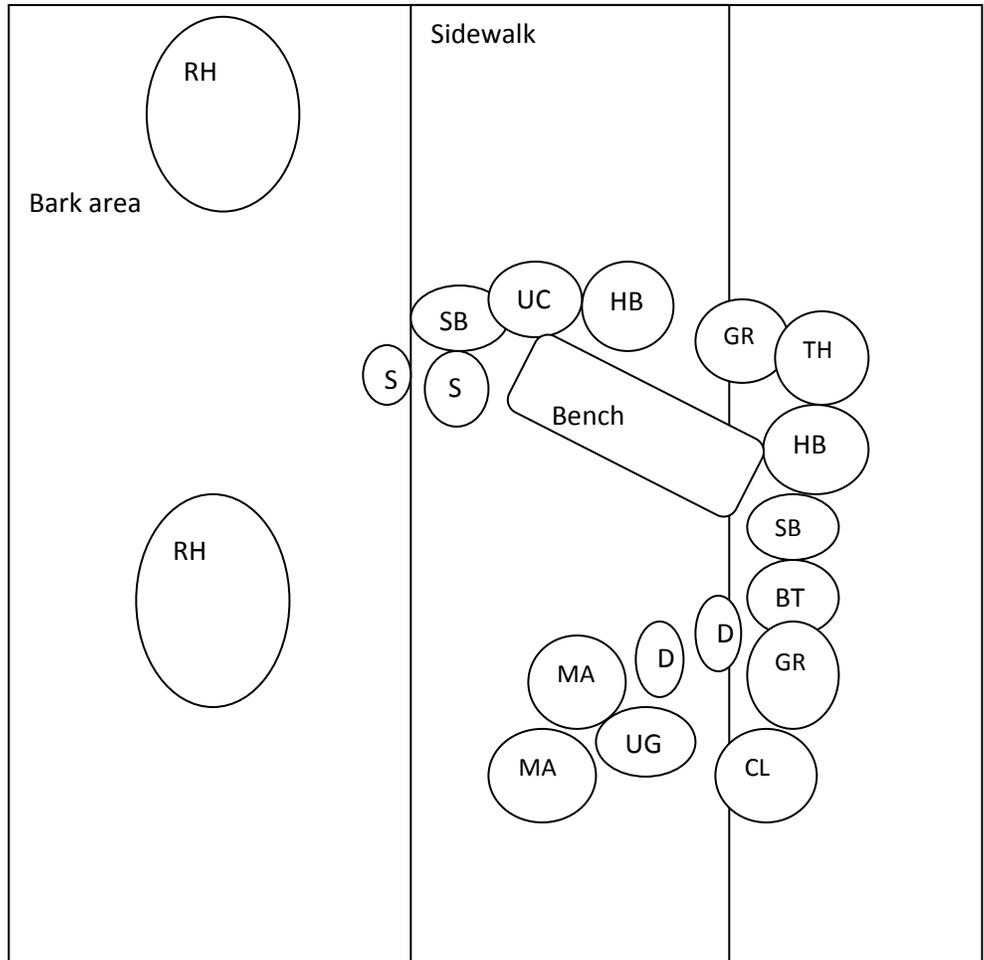
Sincerely,

Deborah Upington  
Graduate Student Researcher  
Design & Human Environments

Appendix F - Maze Samples



Appendix G - Patio Garden Layout



- |                              |                                      |
|------------------------------|--------------------------------------|
| BT = Baby Tears (White)      | SB = Spring Bouquet (White)          |
| CL = Clematis (Purple)       | TH = Thymus (Red)                    |
| HB = Heavenly Bamboo         | RH = Rhododendron (Red-Pink)         |
| MA = Minimus Aurueus (White) | UG = Unicorn Grass (Twisting stalks) |
| D = Snap Dragons (Yellow)    |                                      |