WALKING THROUGH NATURE: PERCEPTIONS OF DANGER AND ENVIRONMENTAL RESTORATION

Submitted by

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For the award of the degree of

DOCTOR OF PHILOSOPHY

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MARCH 2010
SUMMARY

Natural environments typically afford numerous physiological and psychological benefits, many of which fall under the category of restoration. However natural environments can also contain a number of dangers stemming from other people, animals and the surrounding environment that are likely to be counter to restoration. The distinction between different types of danger is important because different dangers may be perceived differently. This thesis addressed this issue, exploring the role of danger and fear in perceptions of a natural environment. It also examined the role that the physical structure of the environment plays as existing research suggests that physical features that influence being able to see and be seen have an impact on perceptions of danger and emotional experiences in an environment. Five studies were conducted utilising both quantitative and qualitative techniques. This included two on-line experimental studies examining perceived restoration and danger; one laboratory study examining the presence of a severe danger on perceived restoration; one study comparing actual restoration in both a laboratory and field environment and one qualitative exploratory study. These studies found that in the absence of any specific danger or threat, variations in the physical structure of the environment resulted in differences in perceptions of danger, fear, preference and restoration. They also supported the clear distinction made between different types of danger in a natural environment (physical, social and lost). Of these dangers, the threat of being attacked by another person appeared the most damaging to preference for an environment and perceptions of restoration, overriding the effect of variations in prospect-refuge. So although the design of a natural environment can influence perceptions of an environment in both the absence and presence of a physical threat, this does not appear to be the case when people have a reason to believe that a social threat is present.
This thesis and the work to which it refers are the results of my own efforts. Any ideas, data, images or text resulting from the work of others (whether published or unpublished) are fully identified as such within the work and attributed to their originator in the text, bibliography or in footnotes. This thesis has not been submitted in whole or in part for any other academic degree or professional qualification. I agree that the University has the right to submit my work to the plagiarism detection service TurnitinUK for originality checks. Whether or not drafts have been so-assessed, the University reserves the right to require an electronic version of the final document (as submitted) for assessment as above.
ACKNOWLEDGEMENTS

It took a long time and a lot of perseverance to write this thesis and I would like to express my sincere thanks to those people who have helped me through this process. I would firstly like to thank the Department of Psychology for offering me a bursary that gave me the financial security to stay on at University and undertake this research.

I have been very fortunate to work with a supervisor that has helped me through the PhD process with her constant encouragement and logical thinking. Birgitta was instrumental in igniting my interest in environmental psychology and her help in guiding me through this long and arduous process has been invaluable. I would also like to express my sincere thanks to Andrew Barnes, Nigel Woodger and Mark Cole for their enthusiasm and perseverance in helping set up my research studies.

I consider myself very privileged to have such a supportive network of friends and family around me. Within the department, I would like to thank the ‘circle’ for their coffee breaks, Feast breaks and lunches that offered such a welcome distraction from my work. I would also like to thank my Mother, Father, Brother for their constant support and encouragement throughout the past three and a bit years.

Finally I would like to thank everyone else who kept asking me these past three years: "Have you finished yet?" Silencing this question was a prime motivation when life's other intellectual enticements kept singing to me.
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CHAPTER 1

INTRODUCTION TO THESIS

Imagine you have just finished an extremely busy morning at work. You have gone to meetings, had to deal with irate customers on the phone and you have worked like crazy trying, but failing to get a report finished on time. It is now lunchtime and to escape the workplace and the stress it has given you, you decide go for a walk in a park. It is quiet, sunny and you can hear the birds chirping away in the trees. As you stroll along the winding path, you start to feel better. You are happier, less stressed and your previously muddled mind feels refreshed and clear. You decide to keep walking, feeling increasingly distant from the busy modern world. But just as you are walking along, you stumble and trip over an exposed tree root, falling to the floor and grazing your hands. Your pristine white shirt is now covered in mud. How would you feel? Now imagine this. You are in the same situation but instead of falling over a tree root, you suddenly feel that you are being followed. You can hear footsteps behind you and when you turn around you think that you can just see someone disappearing behind some bushes. How would this make you feel?

1.1 AIM OF THESIS AND BACKGROUND TO RESEARCH AREA

This thesis has two main aims. Firstly, to explore the specific types of danger that people may perceive or encounter in a natural environment and secondly, to explore the mediating role that the physical structure of the environment plays in the perception of these dangers.

Natural environments have long been associated with providing numerous health benefits including a general capability to evoke positive emotions such as happiness, tranquility and relaxation whilst reducing feelings of stress, fear and frustration (e.g. Cackowski & Nasar, 2003; Hung & Chang, 2004; Parsons, 1991; Parsons, Tassinary, Ulrich, Hebl & Grossman-Alexander, 1998; Ulrich, 1984; Ulrich, Simons, Losito,
Fiorito, Mailes & Zelson, 1991). As negative emotion tends to be highly correlated with stress (Brannon & Feist, 1997), it is unsurprising that natural environments have also been shown to offer physiological benefits in the form of positive changes in blood pressure, heart activity and brain electrical activity within less than five minutes of exposure (Hartig, Mang & Evans, 1991; Ulrich, 1981; Ulrich et al., 1991). Other health benefits include an improved ability to concentrate and direct attention in response to contact with nature (e.g. Berto, 2005; Tennessen & Cimprich, 1995). Environments that promote recovery from stress or exhausted attention often do so through the process of restoration. Han (2003) defines restoration as ‘the process of returning a person back to their original healthy condition from previous physical and/or psychological deprivation.’ In a time of escalating health care costs, increasing mental health problems amongst the population and declining environmental quality, health promotion strategies that incorporate a natural element may prove valuable to an increasingly urbanised population (Hartig, Jamner, Davis & Gärling, 2003).

But there is a dark side to natural environments. Nature contains many different sources of potential danger that may or may not evoke negative reactions, including natural threats such as predators, venomous animals and lightning (Tooby & Cosmides, 1990) but also the threat of being attacked by another individual (Burgess, 1998; Coble, Selin & Erickson, 2003). Indeed enclosed, dark and dense wooded areas may prove intimidating rather than therapeutic (Milligan & Bingley, 2007). If this proposition is correct, natural environments that are perceived as dangerous may face dwindling visitor numbers and may result in the environment losing some of its therapeutic and restorative potential, reducing the effectiveness of any health promotion strategies that they may be incorporated in. So what is the effect of danger on restoration?

To date, the effects of different sources of danger on the restorative benefits typically associated with natural environments have not been directly examined. Intuition would lead us to believe that dangerous situations would impede restoration. Herzog and Kirk (2005) adopt an evolutionary standpoint to propose that generally speaking, danger is given a high priority because it typically threatens survival. In such instances, one would expect other perceptions such as restoration to be deferred and deemed a lower priority. Danger is actually likely to invoke the negative physiological
and psychological states that restoration is trying to overcome by evoking negative emotion, draining attentional resources and mobilising the stress response. However this argument makes no attempt to distinguish between the different sources of danger. Only a handful of studies have made this distinction, but none in relation to restoration. Herzog and Miller (1988) found that although social danger (danger that stems from another individual) reduced preference for an environment, physical danger (danger that stems from the physical structure of the environment) did not. Other research has demonstrated that participants in wilderness programs often report that confronting the physical dangers present may inspire feelings of awe, leading to thoughts about spiritual meanings and eternal processes (Frederickson & Anderson, 1999; Kaplan & Kaplan, 1989). Furthermore activities that one can undertake in natural environments such as kayaking and rock climbing suggest that to some individuals, danger may actually be perceived as attractive and positive rather than frightening and negative (Loeffler, 2004). The majority of research focusing on danger has done so within the confines of urban environments. Natural environments contain a far more diverse range of dangers and by making this distinction and using natural environments, we can not only add to the understanding of the effects of danger, but also understand the effects of danger on the restorative benefits that many of us visit natural environments for. But what are the practical implications we can derive from conducting this research? By understanding which specific types of danger impede restoration, this research will, amongst other things, explore how the physical structure of a natural environment enhances or reduces the perception and impact of these dangers. Fisher and Nasar’s (1992) typology of prospect-refuge advocates that environments where one has an impeded view of the environment ahead (low prospect), there are a high number of hiding places for a potential offender (low refuge) and where escape is difficult because of obstacles and obstructions (low accessibility) are perceived as highly dangerous and less preferred. Conversely an environment where one has a clear and penetrating view of the environment ahead (high prospect), where there are few hiding places for a potential offender (high refuge) and were there is a clear and unobstructed pathway (high accessibility) are perceived as less dangerous and more preferred. Although the typology has been applied to urban environments to explain variations in perceptions of danger
(e.g. Nasar & Jones, 1997; Petherick, 2000/2001; Wang & Taylor, 2006), it has not been explicitly tested in natural environments, in relation to specific types of danger or to see if there is any impact on perceptions of restoration.

The identification of physical features that enhance or reduce perceptions of danger could then be used to guide the environmental design of natural environments to ensure they remain restorative and valuable to the public. Country parks are perfect examples of natural environments that could benefit from this research. Country parks provide visitors with an excellent environment that can facilitate good health and well-being through opportunities to participate in outdoor recreation and exploration of greenspace that may be able to help relieve the stress-related symptoms that accompany modern life (Countryside Agency, 2004). In England, the majority of country parks are located on the rural-urban fringe within only a few miles of a large town or city and in total, receive an estimated 73 million visits per annum (Countryside Agency, 2004). Despite country parks generally faring better than their urban counterparts (Urban Parks Forum, 2001), a concerted effort towards a country parks renaissance is being made, with the UK’s Forestry Commission actively planning to develop more wooded areas near to cities and on old brownfield sites.

1.2 OVERVIEW OF CHAPTERS

Following on from the extensive literature review in chapter 2, chapters 3 to 7 describe a series of research studies designed to address some of the key issues raised. Chapter 3 describes an initial research study designed to examine the research area and explore the effect of prospect-refuge on - and relationships between perceptions of danger, fear, preference and restoration using simulated walks through a natural environment. More specifically, it tested the perception of different types of danger, the relationships they shared with positive and negative perceptions of an environment and whether variations in prospect-refuge resulted in significant differences in these perceptions. The study found that, higher levels of prospect-refuge were more preferred and perceived as more restorative than lower levels of prospect-refuge. Higher levels were also found to evoke less fear and be perceived as less dangerous, both in general
terms and in response to the perceived likelihood of encountering physical danger and becoming lost. However variations in prospect-refuge did not result in differences in the perceived likelihood of encountering a social danger. Of the specific types of danger, the perceived likelihood of encountering a social danger was found to have the strongest effects on perceived danger and fear (positive) and preference and perceived restoration (negative). Conversely the perceived likelihood of encountering a physical danger was found to have much weaker effects.

Chapter 4 continues exploring the distinction between different types of danger. It describes a research study that manipulated the threat of different types of danger within a country park, exploring the effects on perceptions of danger, fear, preference and restoration. Once again, these effects were explored using simulated walks through a country park that differed in levels of prospect-refuge. In support of chapter 3, the distinction between different types of danger proved extremely useful as some types of danger threat did not have any discernable effect on fear, perceived restoration or preference. However a social danger threat was found to be particularly detrimental, increasing fear and reducing perceptions of restoration and preference. The threat appears to have such a detrimental effect that variations in prospect-refuge will not impact on perceived restoration or preference in such a situation.

The studies in chapters 3 and 4 highlighted the particularly damaging effect of perceptions of social danger on perceptions of restoration and environmental preference. As a result, the study described in chapter 5 focused exclusively on the effects of the manipulated presence of social danger. The study explored the effects of this manipulation on perceptions of danger, fear and restoration during simulated walks that once again differed in levels of prospect-refuge. As expected, the imagined presence of a severe social danger proved extremely detrimental to perceptions of restoration. However some interesting interactions were found that supported those found in chapter 4, with the presence of a severe social danger found to have a much greater detrimental effect on perceived restoration in a high prospect-refuge environment than a low one.

Chapter 6 describes a research study that explores the effect of prospect-refuge on actual measures of restoration using both field and simulated walks to see if it supports the findings of the preceding studies which used measures of perceived
restoration. The results proved encouraging, sharing a high degree of congruence with the perceived restoration findings of chapters 3, 4 and 5 and demonstrating a general tendency for high prospect-refuge environments to be more restorative than low prospect-refuge ones.

Chapter 7 describes the final research study which adopted a largely qualitative framework to explore people's perceptions of danger and the role of the physical structure of the environment. This study offers a deeper and more subjective insight into the perception of danger within a natural environment and the role that the physical structure of the environment can play in these perceptions. Some key themes emerged from participant's responses that provide further support for the distinction between different types of danger and the important roles that physical features (which provide/withhold prospect, refuge and accessibility) play in the perception of a natural environment.

Finally chapter 8 provides a summary and in-depth discussion of the research conducted in chapters 3 to 7, relating the findings to relevant theory and existing research. It also discusses the important theoretical, methodological and practical implications raised by this research before a short conclusion regarding the major findings and implications of this work is provided.
CHAPTER 2

LITERATURE REVIEW

2.1 NATURAL ENVIRONMENTS: DEFINITION AND BENEFITS

Defining what constitutes a natural environment is a rather difficult issue. Some researchers have tried to emphasise the physical features that natural environments possess. For example, Mausner (1999) regards nature as including discrete elements such as vegetation or water, with the potential for small natural elements such as trees or artificial ponds. Others have highlighted the way natural environments tend to differ from built environments. Sebba (1991) argues that natural environments contain softer, rounder, more varied and ambiguous shapes than built environments. He also argues that natural environments also contain a greater range of stimulus intensities (e.g. hot/cold, wet/dry) in conjunction with less human control than built environments. However these definitions only focus on the physical features that may or may not be present in a natural environment. They do not make the role of human management explicitly clear. Can an urban park be regarded as a natural environment? Balling and Falk (1982) claim that natural scenes do not necessarily lack human management, but are devoid of artifacts. Examples include parks, pastures and even golf courses. Broadly speaking, Western and Asian adults tend to judge a scene as natural under three conditions: (1) if the landscape is dominated by water, vegetation and mountains; (2) if artificial features are absent or concealed; (3) if the dominant contours or visual profiles are curvilinear or irregular rather than rectangular or regular (Ulrich, 1983). The term ‘natural environments’ therefore represent a very broad class of environment that range from managed settings such as urban parks, to untamed settings such as wilderness. Because of the huge range of environments and potential for variability that the term ‘natural environment’ encompasses, this thesis will focus exclusively on one type of natural environment known as a country park.
2.1.1 Background to country parks

Country parks are examples of natural environments in the United Kingdom that are readily accessible to a substantial proportion of the population. A legacy of the 1968 Countryside Act, they were borne out of a concern to protect the greater countryside from the perceived threat of an increasing number of potential recreational urban dwellers who found themselves with increased income, mobility and leisure time (Holdaway, 1971). Planners initially intended to use the country park as a ‘honey pot’, attracting urbanites seeking recreation in natural environments away from national parks or areas of outstanding natural beauty in order to protect such places. By 1978 the original ‘honey pot’ concept had changed from an emphasis on rural locations that were only accessible by car, to favouring country parks in urban fringe areas. The formation of country parks diminished in the 1980s and combined with limited access to funding opportunities in the 1990’s, meant that most country parks faced a period of stagnation and a lack of clarity and purpose of their role and future. In 2000, the Countryside Agency launched their programme for the ‘renaissance’ of country parks, with the UK Forestry Commission actively seeking to develop more wooded areas on the urban fringe and brownfield sites. The majority of country parks were designated in the 1970s under the 1968 Countryside Act which stated the minimum criteria in order for parks to be ‘recognised’ and recorded as a country park by the Countryside Commission. However the Act fell short of establishing provision for the statutory designation of country parks and resulted in some uncertainty and confusion over what now should be defined as a country park. The Country Parks Network (CPN) has now set out a series of 16 essential and 24 desirable criteria to reflect the size, accessibility, core services and facilities that parks should possess in order to be classified as a country park. A country park therefore represents a fairly managed example of a natural environment, typically containing a diverse range of habitats including heathland, download, marshland and both coniferous and deciduous woodland.
2.1.2 The health benefits of contact with nature

It appears that people intuitively appreciate the health benefits that contact with specific types of nature typically affords. In a large survey of Swedish residents, Grahn and Stigsdotter (2003) found that when asked to indicate what they would recommend a friend to do if they were feeling stressed or fatigued, most participants gave taking a walk in a forest as their initial response. There is also a long history of medical professionals such as Florence Nightingale recommending visiting these environments to convalesce after illness. An extensive body of empirical research demonstrating the emotional, physiological and health benefits that contact with nature typically provides further supports the common belief that natural environments can provide health benefits. These benefits include reducing feelings of fear, stress, frustration, aggression and arousal whilst increasing positive feelings such as happiness, tranquility, relaxation and friendliness (e.g. Cackowski & Nasar, 2003; Hung & Chang, 2004; Parsons, 1991; Parsons, Tassinary, Ulrich, Hebl & Grossman-Alexander, 1998; Ulrich, 1984; Ulrich, Simons, Losito, Fiorito, Mailes & Zelson, 1991). Even urban environments that contain natural elements have been found to afford better health benefits than similar environments devoid of natural elements (Hernandez & Hidalgo, 2005). Lower mortality rates of the elderly in Japanese megacities have also been found when there are green paths and spaces in close proximity to their residences (Takano, Nakamura & Watanabe, 2002). Even short exposure to nature in urban parks has been shown to boost feelings of calmness and energy (Hull, 1992) while simple participatory experiences with nature such as gardening can also provide therapeutic benefits (Lewis, 1996).

2.1.3 The benefits of exercise and recreation in natural environments

Natural environments may also provide health benefits by being particularly conducive to engaging in recreation or exercise. Two large scale epidemiological studies conducted in The Netherlands further highlight the positive impact of natural environments for health (De Vries, Verheij, Groenewegen & Spreeuwenburg, 2003; Mass, Verheij, Groenewegen, De Vries & Spreeuwenburg, 2006). Both studies revealed
that residents of neighbourhoods with copious amounts of green space tended to self-report fewer health problems. This positive association between green space and health was particularly evident among the elderly, housewives and participants from low socio-economic groups. These benefits may not only be a consequence of the restorative quality of green space, but may also result from opportunities to exercise (e.g. walking or cycling) and build social contacts (green spaces may act as a meeting place and so reduce health problems typically associated with social exclusion); or from a better ambient environment characterized by better air quality and less noise. Indeed exercising within a green environment appears to have a greater positive effect on individuals than exercising in a non-natural environment or indoors. Harte and Eifert (1995) examined the health benefits of physical activities between outdoor and indoor settings and found that running through outdoor semi-rural settings was capable of reducing negative emotions whilst running indoors on a treadmill did not. Viewing a pleasant rural scene while running on an indoor treadmill has also been shown to have a more positive impact on emotion than running on an indoor treadmill whilst exposed to unpleasant rural or urban scenes (Pretty, Peacock, Sellens & Griffin, 2005). The type of exercise one engages in with natural environments has also received some recent interest. Hansmann, Maria-Hug and Seeland (2007) examined how the type of exercise in forests and urban parks affected self-reported stress and psychological balance and concluded that more strenuous exercise such as jogging or cycling produced greater improvements than participating in less strenuous activities such as walking or relaxing. This collection of research further demonstrates the health benefits that contact with nature can provide by demonstrating that engaging in recreation and exercise may be particularly beneficial in natural environments.

2.1.4 Public health problems: the role of country parks in improving public health

Public health problems are becoming increasingly prevalent and are receiving ever increasing amounts of attention from the government. The health and well-being of the population is one of the UK government’s primary concerns with the Department of
Health (2004) claiming that ‘The government is absolutely committed to achieving better health for everyone’. Wanless (2004) defines public health in broad terms as ‘the science and art of preventing disease, prolonging life and promoting health through the organised efforts and informed choices of society, organisations, public and private, communities and individuals’. Modern life has become synonymous with crowding, traffic, excessive stimulation and a lack of peace and quiet. The accompanying feelings of stress, anxiety and worry have all been shown to detrimentally influence the physical and psychological well-being of humans (Francis & Cooper-Marcus, 1991). For example, having views of nature from an apartment has been found to increase well-being (R. Kaplan, 2001) while residents of urban neighbourhoods with poor living conditions and few environmental facilities that offer a place of refuge to escape these stressors tend to display more symptoms of chronic stress and poor health (Steptoe & Feldman, 2001). This finding is independent of the individual characteristics of residents. The World Health Organization (WHO) claims that stress and depression are increasing and estimate that by 2020, depression and depression-related illnesses will be the greatest source of ill health. The cost of mental health problems in England has been estimated at £32 billion with more than a third of this attributed to loss of employment and productivity (Mental Health Foundation, 2006). Almost 10 percent of adults in the United Kingdom experience mixed anxiety and depression (British Heart Foundation, 2004). In addition, physically inactive lifestyles and chronic stress are related to physical illnesses such as coronary disease and cancer (Kopp and Rethelyi, 2004; Krantz & McCeney, 2002).

Because of the documented health benefits that contact with nature typically affords, natural environments such as country parks could therefore play an important role in helping to prevent and treat physical and mental health problems. The importance of utilizing natural environments to promote health and well-being is evident in the publication of books such as “Last Child in the Woods” (Louv, 2006) which documents the growing societal interest in understanding these health benefits and in particular, the nature-deficit in today’s children. In a time of escalating health care costs, increasing mental health problems amongst the population and declining environmental quality,
health promotion strategies that incorporate a natural element may prove valuable to an increasingly urbanised population (Hartig, Jamner, Davis & Gärling, 2003).

Country parks could be of particular value, given that there are over 270 within England, cover over 38,000 hectares and the majority are located on the rural-urban fringe collectively receiving an estimated 73 million visitors per year (Countryside Agency, 2004). Country parks provide visitors with an excellent environment that can facilitate good health and well-being through opportunities to engage in a healthier lifestyle and participate in outdoor recreation and exploration of greenspace that may be able to help relieve the stress-related symptoms that accompany modern life (Countryside Agency, 2004). One of the desirable criteria for a country park is the provision of a programme of events and activities that promote healthy living. Various public bodies have devised specific strategies to improve the health and wellbeing of visitors. A substantial proportion of country parks contain a woodland environment and some country parks are run in conjunction with the UK Forestry Commission. In 2005, The Forestry Commission launched their “Active woods – naturally good for you” campaign with the aim of establishing an association in people’s minds between health and well-being and woodlands, to promote physical activity among forest users and to help foster healthier lifestyles. Berger (1996) identifies four psychological benefits linked to physical activity: a higher quality of life, enhanced mood, stress reduction, and a more positive self-image. In conjunction with the physiological and psychological health benefits contact with nature typically affords, natural environments and in particular country parks may help foster healthy lifestyles through being used as a source of recreation and physical activity.

2.2 RESTORATION: DEFINITION, THEORIES AND MEASUREMENT

Many of the physiological and psychological benefits that natural environments such as country parks can afford may be conceptualised as outcomes of restoration. Restoration is best defined as the process of returning a person back to their original
healthy condition by renewing physical, psychological and social capabilities that have been reduced as a result of dealing with adaptive demands (Han, 2003).

Rather than concentrating on any one environment, theories concerned with restoration have chosen to emphasize the specific characteristics or qualities of the transactions between a person and the environment (Kaplan, 1995; Kaplan & Kaplan, 1989; Ulrich, 1983). These theories posit that these characteristics or qualities will be more typical in experiences within specific environments, thus conforming to some extent, with stereotypic notions regarding the overall restorative quality of those environments.

Two theories have been devised to try and explain what makes an environment restorative and to help explain why natural environments typically provide greater restorative benefits than urban environments. Ulrich's (1983) Stress Recovery Theory (SRT) is grounded in well-established stress theory and research that encompasses a wide range of emotional, physiological and cognitive responses to stressors. Kaplan's (1995; Kaplan & Kaplan's, 1989) Attention Restoration Theory (ART) is based on extensive research into environmental preference and affective studies of natural environments. This theory adopts a cognitive framework to explain the restorative process on the recovery of mental fatigue.

2.2.1 Stress and Ulrich's (1983) stress recovery theory (SRT)

Selye (1956) defines stress as the consequences of a human or animal's response capabilities failing to adequately respond to an emotional or physical threat to the organism. Although other conceptualisations of stress have been put forward by researchers (e.g. Cox & Mackay, 1976; Lazarus, 1966), a common theme has emerged whereby stress is regarded as a process where an individual feels unable to cope as a result of demands exceeding their perceived capacity to cope. Triggers of stress may be real and immediate threats to survival or they may be more minor everyday psychological triggers such as worrying about losing one's job.
When confronted by a threat, whether it is physical or emotional, real or imagined, the hypothalamus causes the sympathetic nervous system to release epinephrine and norepinephrine from the adrenal medulla. This increases heart rate, glucose availability and blood pressure, propelling the body into a state of heightened arousal. Blood flow is also redirected away from non-essential organs (reproductive and gastrointestinal) towards the heart and striated muscles so that the animal may respond by fighting or fleeing the stressor/threat. This response, known as the stress response is critical to the survival of primitive humankind, preparing the body for a physical reaction to a threat - mobilising the body to deal with stress, consume energy that results in fatigue and adopt appropriate behaviour strategies (Ulrich et al., 1991). Although the stress response is necessary in times of emergency, the frequent or unrelenting triggering of the stress response without a balancing relaxation response can result in the body becoming exhausted, contributing to a number of negative physiological and psychological repercussions. These include a weakened immune system along with heightened blood pressure, heart rate and muscle tension (Ulrich, 1999). Stress also tends to manifest itself in negative emotion such as fear with the two appearing to be highly positively correlated (Brannon & Feist, 1997).

A stressful environment is therefore perceived as harbouring some form of threat to an individual that they perceive as being beyond their control. This could be a real threat to survival such as encountering a dangerous animal such as a bear or snake, or a perceived threat, such as walking through a dark environment wondering if there is someone around the corner who may try and attack. Alternatively a stressful environment may contain psychological sources of stress rather than a physical threat to survival. Take the demands of a busy commute. Here an individual must negotiate their way through a busy overcrowded environment, where other people bump into them and where their personal space feels invaded.

SRT claims that restoration is derived from the reduction of stress and the corresponding negative emotion through interacting with a physical environment that is a source of reprieve rather than stress. The theory assumes that humans have an innate disposition to try and avoid stress and respond positively to natural stimuli that facilitates rather than threatens survival. Nature typically provides a restorative
setting where solace and refuge can be taken from the everyday pressures of life and environmental stressors such as noise, overcrowding and the invasion of personal space. This in turn causes automatic physiological and psychological responses that underpin recovery from stress to occur by invoking a positive affective state in conjunction with a decrease in physiological arousal that increase feelings of well-being through relief from stress (Ulrich et al., 1991). It is important to acknowledge that restoration from stress may not be solely restricted by reducing excessive arousal, but also recovery from very low levels of arousal.

From looking at research into restorative environments, Ulrich (1999) developed a framework of four factors that are an integral part of a restorative environment. These four factors that are proposed to facilitate stress recovery are: sense of control, social support, physical movement, and natural distractions.

*Sense of control.* Whether actual or perceived, control allows an individual to feel as though they are able to control their behaviour in response to a stressful event and adopt effective coping strategies to overcome stress. For example, to escape stress at work, Ulrich (1999) claimed that people reported feeling better just knowing that there was a park nearby that they could escape to. This was the case even if people did not choose to exert control over being stressed at work by visiting the park.

*Social Support.* Having a social support network that provides opportunity for interaction often produces feelings of inclusion and belonging that increase well-being and reduces stress (Ulrich, 1999). People who are looking to socialise tend to prefer more spatially enclosed spaces whilst people wanting to watch others passively tend to prefer a more spatially open space (Ulrich, 1999).

*Physical Movement and Exercise.* Not only do exercise and physical activity provide health benefits from engaging in healthier lifestyles, but they also offer a valuable source of distraction from stressful events that have been found to reduce stress, depression and anxiety (Ulrich, 1999). By engaging the mind in physical movement and exercise
instead of dwelling on sources of stress in an individual’s life, stress and corresponding negative emotions may be reduced.

*Natural Distractions.* Various studies highlighted earlier in this review have shown the health benefits of contact with nature. Environments that are most likely to afford these benefits typically include clear and slow moving water, openness, some small wildlife and a mixture of trees and grassland (Ulrich, 1999). By providing features that emphasize nature, one could realistically expect that such environments would typically provide the most restorative experience.

2.2.2 Measures of physiological stress recovery and research supporting SRT

The most common indicators of physiological stress recovery that have been examined include measuring systolic and diastolic blood pressure using ambulatory monitoring equipment (Hartig, 1991; Hartig, Evans, Jamner, Davis & Gärling, 2003; Parsons et al., 1998; Ulrich et al., 1991); skin conductance typically measured over the thenar and hypothenar eminence of the right hand (de Kort, Meijnders, Sponselee & Ijsselsteijn, 2006; Parsons et al., 1998; Ulrich et al., 1991); heart rate using an electrocardiogram (de Kort et al, 2006; Heerwagen, 1990; Laumann, Gärling & Stormark, 2003; Parsons et al., 1998; Ulrich et al., 1991); alpha frequency brain activity measured using an Electroencephalograph (EEG) (Chang, Hamitt, Chen, Machnik & Su, 2008; Ulrich, 1981); muscle tension measured using an electromyography (EMG) (Chang et al., 2008; Ulrich et al., 1991) and the use of potent analgesics (Ulrich, 1984).

A number of studies have attempted to compare physiological stress recovery in natural environments with urban environments (e.g. Hartig, 1991; Hartig, Böök, Garvill, Olsson & Gärling, 1996; Hartig, Mang & Evans, 1991; Hartig et al., 2003; S. Kaplan, 2001; Ulrich et al., 1991). In support of SRT, viewing natural environments appear to foster faster and greater recovery from physiological stress than urban environments by lowering blood pressure and heart rate (Hartig, 1991; Hartig et al., 1991; Hartig et al., 1996; Ulrich et al., 1991), reducing hand sweating and muscle tension (Hartig et al., 1991; Ulrich et al., 1991) and the production of certain stress hormones (Parsons et al.,
1998; Ulrich, 1984). Regarding the physiological duration of stress recovery, laboratory and clinical studies have demonstrated that viewing natural scenes can produce significant positive changes in physiology including a reduction in blood pressure, heart activity, muscle tension, and brain electrical activity within less than five minutes (Ulrich, 1981; Ulrich et al., 1991). However environmental effects on performance do not consistently emerge until around 15-20 minutes (Hartig et al., 1996).

2.2.3 Measures of emotional restoration and research supporting SRT

Given the typically positive association between stress and negative emotion (e.g. Brannon & Feist, 1997), it is unsurprising that the vast majority of research exploring physiological restoration has demonstrated a greater reduction in stress in conjunction with an improvement in mood and/or fewer reported ailments as a result of viewing natural rather than built scenes. This has been found in a number of settings including healthcare environments (e.g. Heerwagen, 1990; Ulrich, 1984), car driving commuters (e.g. Cackowski & Nasar, 2003; Hartig, 1991; Parsons et al., 1998), amongst prison inmates (Maller, Townsend, Pryor, Brown & St Leger, 2005; Moore, 1981) and office workplaces (Leather, Pyrgas, Beale & Lawrence, 1998). Hartig et al. (1996) claim that natural scenes are able to alleviate stress by blocking pessimistic thoughts, replacing positive for negative emotion and re-equilibrating physiological disturbances.

Simon (1982) defines emotion as the general feeling of a person at a specific point in time. One popular way of measuring emotion has been through Zuckerman’s (1977) Inventory of Personal Reactions (ZIPERS). The ZIPERS measures five dimensions of emotion (positive affect, attentiveness, fear arousal, sadness and aggression) and has been a popular and sensitive measure in previous studies examining emotional restoration (Hartig et al., 1991, 1996, 2003; Ulrich et al., 1991). Campbell, Converse and Roger’s (1976) Overall Happiness Scale (OHS) has also received some use as an indicator of emotional restoration in some of Terry Hartig’s work (Hartig et al., 1991, 2003).
Another popular technique has been exploring people’s changes in moods as a result of attributing an affective quality (e.g. boring, interesting, pretty) to an object or environment (e.g. Hull & Harvey, 1989; Marselle, 2004; Staats, Gatersleben & Hartig, 1997). A mood is a relatively lasting emotional or affective state and represents the ‘core emotional feelings of a person’s subjective state at any given moment’ (Russell & Snodgrass, 1987). Moods differ from emotions in that they are less specific, often less intense, less likely to be triggered by a particular stimulus or event, and longer lasting (Thayer, 1989). The process of attributing an affective appraisal can ultimately guide whether an individual explores or withdraws from the environment (Mehrabian & Russell, 1974). This is especially important for recreational settings because individuals may engage in recreation because they are motivated to experience specific emotions. Given that much recreation takes place in natural environments such as sports, hiking and seeking to escape everyday urban stressors, Hull (1990) claims that mood appears to be an important way of judging the quality of a recreational excursion in a natural environment.

Russell and Lanius’ (1984) circumplex model of affect attempts to represent the affective qualities of an environment using commonly used emotional terms in a space that is defined by two underlying independent bipolar dimensions. According to the model, emotional reactions in the form of affective appraisals can be described by their relative position on the horizontal unpleasant-pleasant dimension and the vertical not arousing-arousing dimension. The positions of these emotional reactions are represented in a circular array within the space with few words for emotional neutrality. For example, the model implies that a tranquil environment should be moderately pleasant but not very arousing. Conversely, a hectic environment is particularly arousing and unpleasant. Wohlwill (1974) claims that differences in preference levels that individuals express despite evaluating identical environments using the same psychological dimensions may be a result of differing adaptation levels where each individual has an optimum level on any one dimension and deviations from that optimum require adaptive measures to be taken (e.g. reduce arousal or seek stimulation). The circumplex model of affect has been used to examine how the physical characteristics of parks influence emotion (Hull and Harvey, 1989) and to examine the change in mood in response to
changes in density and accessibility in a simulated forest environment (Staats et al., 1997). In both cases, it was concluded that the model was a valid tool for the study of environment and behaviour.

More recent work using the model outside of environmental psychology has claimed that pleasure (or valence) is best captured by two unipolar dimensions of positive and negative affect rather than a single bipolar scale (Davis, Zautra & Smith, 2004; Ito & Cacioppo, 1999). However Davis et al. (2004) acknowledge that in cases of high levels of pain and stress, positive and negative affect become strongly inversely related when negative affect tends to dominate. In cases such as this, valence behaves as a bipolar dimension. However the model does appear a potentially relevant tool for measuring emotion in this thesis in instances where danger is present or the threat of it manipulated. As one would expect danger to prove stressful to individual, we have reason to expect that pleasure (or valence) will behave as a single bipolar dimension as the model suggests rather than two unipolar scales of positive and negative affect.

2.2.4 Kaplan's (1995; Kaplan & Kaplan, 1989) attention restoration theory (ART)

ART is based on extensive research into environmental preference and affective studies of natural environments. This theory adopts a cognitive framework to explain the restorative process on the recovery of mental fatigue. According to the theory, there are two main types of attention; directed and involuntary. Directed attention forces the mind to actively engage and focus attention towards boring stimuli, even in the presence of more exciting stimuli (Kaplan & Kaplan, 1989). Directed attention therefore plays an integral role in the exhibition of socially responsible behaviour by inhibiting inappropriate responses. Without directed attention, performing focussed activities in the presence of distractions would be impossible. Support for this can be found in a study by Kaplan and Kaplan (1989) who asked participants to perform attention-demanding tasks in highly demanding environments. They found that some participants became more aggressive, less tolerant and less likely to help others in need. Like a battery, our directed attention capacity is fixed and can be rapidly depreciated by completing a
prolonged and intense task. As directed attention diminishes, we become fatigued and more prone to distractions. This is when it needs to be rested and recharged. Resting directed attention allows the inhibitory mechanism that blocks out distractions and focuses attention to recover the capacity to direct attention once again. Although sleep may help, it is insufficient and often inconvenient. ART proposes that our directed attention is best recharged by resting it and being drawn to a source of involuntary attention. Involuntary attention, or fascination, requires little or no effort from the individual to consciously direct themselves towards the stimuli. Examples of this include an exciting event or something that catches the eye because it is attractive or unusual.

Berto, Massaccessi and Pasini (2008) found significant differences in eye movements between photographs of low and high fascination with photographs high on fascination being associated with less eye movements and fixations than photographs low on fascination despite viewing time being the same. This was interpreted as implying that photographs high on fascination were viewed without really focussing on particular features and using less directed attention. However it is important to emphasise that sources of involuntary attention only provide restorative effects when accompanied by a positive mood and a decrease in physiological arousal. For example, threatening stimuli such as snakes and spiders may evoke involuntary attention but be accompanied by negative emotion and an increase in physiological arousal (i.e. stress). In support of this, Ulrich et al. (1991) found that although showing participants a video of industrial accidents elicited high levels of involuntary attention, participants exhibited symptoms of stress rather than restoration.

Similarly to SRT, a framework of the essential components for restorative environments that restore directed attention has been proposed by the Kaplans for ART. These four essential components are: being away, extent, fascination and compatibility.

*Being away.* Restorative environments are typically different and distinctively separate from the busy urban environments frequented in our everyday lives. By being away from these everyday environments, it allows our everyday thoughts and emotions to also recoil and be replaced as the mind wanders, forgetting its usual attention demanding thought processes. This escape of the mind can also be achieved by a conceptual escape
of the workplace such as visiting an office garden as well as physically escaping the premises. Natural environments in urban areas (e.g. city parks) facilitate a sense of being away because of their novelty to the urban dweller (Kaplan & Kaplan, 1989).

*Extent* is the sense of being in an environment that has sufficient interrelatedness and scope so that one can dwell on it for a period of time. This is whether the physical space is vast or not (Ouelette, Kaplan & Kaplan, 2005). Interrelatedness refers to how the elements of the environment combine to form a coherent and legible overall picture whereas scope provides a space that can be explored through incorporating mystery and complexity. This can be achieved in large spaces e.g. parks, and using objects in small spaces e.g. bonsai trees. This sense of extent, or being in another world, provides an individual with a chance to explore and offers a sense of there being more to find under the surface. This provides an engaging element that affords exploration.

*Fascination* attracts and holds effortless involuntary attention that allows directed attention to recover by providing intrinsic pleasurable activities or content (Kaplan, 1995). Nature typically provides soft fascinations that require little effort to attract our attention e.g. clouds, animals, leaves blowing away. Herzog, Black, Fountaine and Knotts (1997) differentiate between these soft fascinations which allow reflection through engaging all the senses and relaxing the mind rather than an all-absorbing activity known as a hard fascination. Soft fascination provides a modest attraction of involuntary attention whilst offering a pleasurable experience that allows an individual to deal with psychological stress in a relaxed state (Kaplan, 1995). Hard fascination provides an effortless distraction, but the opportunity for reflection does not exist e.g. watching a football match. Herzog et al.’s (1997) study supported these two types of fascination and suggests that soft fascination provides a higher restorative experience.

*Compatibility* refers to how well the environment satisfies and supports the needs of the individual. A compatible environment means that an individual does not have to struggle against elements that are opposed to their needs (Kaplan & Kaplan, 1989). For example,
snakes may provide a source of fascination in nature, but they also evoke fear and a perception of danger. This would not be compatible with the needs of an individual trying to restore directed attention.

Environments that contain these four factors are likely to be extremely restorative. For instance ‘a rock garden in the centre of a large park with exotic plants, shady alcoves, and views out to large trees and buildings’ (Hartig, Korpela, Evans & Gärling, 1997b, p. 181) is a perfect example of a highly restorative environment with these four factors. By providing an escape from the office workplace, it may provide a sense of being away and a sense of extent through the shady alcoves and views. It may also provide a sense of soft fascination through the exotic plants swaying in the breeze and finally, a sense of compatibility if the environment provides a sanctuary to recover that supports the needs of the individual. Although ART proposes that all four restoration components are needed for an environment to be deemed restorative (Kaplan, 1995), these components do not need to be present in equal proportion. Herzog, Maguire and Nebel (2003) provided empirical data to suggest that the relative effectiveness of each of the four factors in predicting the restorative value of an environment may not be equal. The study concluded that compatibility and being-away were far more powerful predictors of restorative potential than extent and fascination. Chang et al. (2008) demonstrated a large degree of congruence between the four theoretical components of ART and actual physiological measures of restoration, with natural environments containing the four components eliciting improved EEG and EMG responses.

In addition to the four factors of ART, Kaplan and Kaplan (1989) proposed that the restoration process consists of four different levels. Initially, a restorative environment allows the mind to clear of distracting thoughts. Secondly, directed attention becomes rested and is restored. This takes a longer period of time than for the first stage. Thirdly, deeper thoughts that have been suppressed by the mind are allowed to emerge whilst soft fascination provides a relaxing environment in which to deal with them. The final level requires the most intense restorative experience and also the most time to occur. Here the individual is able to deal with important life issues e.g. aspirations, goals, and priorities (Kaplan & Kaplan, 1989). These four levels form two
categories of restoration experience benefits (attentional recovery and reflection; Herzog et al., 1997). Attentional recovery involves the first two levels of clearing the mind and the recovery of directed attention. Reflection provides the opportunity to think about unresolved matters and ruminate important life issues. Reflection is a far deeper and advanced part of restoration than attentional recovery and because of this, takes longer to occur.

2.2.5 Measures of attention and research supporting ART

Several objective tests to measure the capacity to direct attention have been used in the restoration literature. Successful measures of attentional restoration include the Necker Cube Pattern Control test (NCPCT) (Hartig et al., 2003; Tennessen & Cimprich, 1995) and the Sustained Attention Response Test (SART) (Berto, 2005). Letter cancellation tasks such as an amended Search Memory Test (SMT) (Hartig et al., 1996; 2003) and d2 Mental Concentration Test (Van den Berg, Koole and van der Wulp, 2003) have proved less successful in detecting significant differences in the restoration of attention between prototypical natural and urban environments.

Tennessen and Cimprich (1995) showed that university dormitory residents who enjoyed a natural view from their window scored better on tests of directed attention (using tasks such as digit-span tests and Necker Cube Pattern Control Test) than residents with less natural views. Hartig et al. (1991) examined the effects of three different restorative environments on attention following a series of cognitively draining activities. The natural environment walk was more restorative of attention than both the urban walk and the relaxation intervention as reflected by the mean scores on a proofreading test following the interventions. More recent research has also been conducted that further validates claims of a positive relationship between the ability to direct attention and having access to natural views (e.g. Berto, 2005; Hartig et al., 2003; Hernandez & Hidalgo, 2005).
2.2.6 Summary of restoration theories

There is a vast array of research that supports both SRT (e.g. Cackowski & Nasar, 2003; Heerwagen, 1990; Ulrich, 1984; Ulrich et al., 1991) and ART (e.g. Berto, 2005; Hartig et al., 2001, 2003; Herzog et al., 2003; Tennessen & Cimprich, 1995). Therefore it appears that these theories should not be regarded as mutually exclusive, but as complimentary to each other. Hartig et al. (2003) found that recovery from both stress and mental fatigue is possible within a restorative environment, but the timeframe and processes of recovery differ. Stress recovery occurs quickly, but can be dispelled quickly too. On the other hand, mental fatigue takes more time to build but also more time to be recovered (Hartig et al., 1996). It is unclear as to whether one condition may result from another, or whether each condition may occur independently. For example, when placed within a stressful situation over time, mental fatigue may rapidly develop as the mind attempts to concentrate in the presence of stressful distracters. Once directed attention has become fatigued, the stressful distracters become attended to and this in turn, triggers the stress response. Conversely, elevated arousal and stress may develop and dissipate over a short period of time thus minimising any chance of developing mental fatigue whilst low levels of mental fatigue may arise without initiating stress (Kaplan, 1995). Although Ulrich’s work regards mental fatigue as a consequence of stress, Kaplan’s work has treated mental fatigue as a condition that increases vulnerability to stress (Hartig et al., 2003). Therefore the two antecedent conditions may occur independently of each other in some situations, but at other times accompany each other in either a reciprocal relationship or merely happen together. Despite the potential for causes of stress and directed attention fatigue to differ, it appears that a restorative environment is able to foster both recovery from stress and the restoration of directed attention.
2.2.7 Perceived restoration and its measurement

The reviewed empirical research has demonstrated that in support of both SRT and ART, the process of restoration manifests itself in positive changes in emotion, physiology and cognitive functioning. As a result, several restoration scales have been devised that measure the perceived restorative value of an environment using a series of items that ask respondents to imagine their physiological and psychological responses if they were actually present in a specific environment. Both Hartig, Kaiser and Bowler’s (1997a) perceived restoration scale (PRS) and Han’s (2003) self-rating restoration scale (SRRS) seek to assess perceived restoration. These measures assume people are able to accurately perceive their physiological and psychological responses to an environment. However the focus of these perceived restoration scales differs, with the SRRS focusing on recovery in broader terms, whilst the PRS exclusively focuses on recovery from mental fatigue.

In addition to emotional, physiological and cognitive dimensions, Han’s (2003) revised 8 item SRRS also includes a behavioural dimension to examine expected behaviour. This dimension was included because behavioural tendency in the form of approach or avoidance behavior is mentioned in both the SRT and ART theories of restoration (Han, 2003). The restoration scale has been tested using slides of the six major terrestrial biomes of the world and analyses revealed that the validity and reliability of the research scale can be considered as an adequate measure that can be applied to measure perceived restoration (Han, 2003).

Hartig et al. (1997b) devised a perceived restorativeness scale (PRS) based on Kaplan and Kaplan’s (1989) ART. The validity and reliability of the PRS was assessed in a series of studies using American, Finnish and Swedish students. Preliminary indications revealed the PRS to be a valid and reliable tool to measure perceived restoration but was unclear as to how many factors should be used to represent evaluations of an environment. Further research by Hartig et al. (1997a) added new items, revising previously used items and used confirmatory factor analysis to test different models relating PRS indicators to theoretical constructs. It was concluded that a
four factor model consisting of the four factors of ART (being away, fascination, coherence and compatibility) was the best way to represent restorative evaluations of an environment. The PRS has been successfully used to measure differences in perceived restoration between different types of environment (Berto, 2005; Purcell, Peron & Berto, 2001) and between different scenes from within the same environment (Ivarsson & Hagerhall, 2008; Tenngart & Hagerhall, 2004). The PRS has also been demonstrated to have a large degree of congruency with physiological responses within natural environments (Chang et al., 2008) suggesting it to be indicative of actual restoration.

A further measure of perceived restoration based on ART has been developed by Staats, Kievet and Hartig (2003) and is based on the attentional recovery and reflection aspects of ART that indicate the perceived likelihood of restoration. This measure has been successfully used as a way of demonstrating the perception of greater attentional restoration following a walk in a natural as opposed to an urban environment (e.g. Staats & Hartig, 2004; Staats et al., 2003). An amended version of this measure with an extra 10 items has also been successfully used to differentiate the perceived likelihood of restoration between natural and urban environments in response to an imagined social danger (Herzog & Rector, 2009).

It is worth noting that both theories of restoration do not describe restoration as a conscious process. In contrast to this, measures of perceived restoration require respondents to consciously anticipate the physiological and psychological changes they would experience being in an environment. Nonetheless the use of validated measures of perceived restoration is becoming increasingly prevalent within the field of restoration research (e.g. Han, 2003; Purcell et al., 2001; Staats & Hartig, 2004; Staats et al., 2003; Tennegart & Hagerhall, 2004). These studies have demonstrated a high level of consistency and congruence with actual measures of restoration, with natural environments typically being perceived as more restorative than their urban counterparts. The results of these studies suggest that people are able to accurately anticipate the restorative potential of an environment and would suggest that perceived restoration is at some level, indicative of actual restoration.

These studies measuring perceived restoration instead of actual restoration have coincided with the use of exposure to environmental simulations as opposed to the
environment in person. This is particularly useful when exposure to the actual environment is not possible. The research conducted as part of this thesis will involve manipulating danger and so for ethical reasons, manipulating danger in a real environment is not possible. This thesis will also manipulate the physical structure of the environment. Simulations provide an opportunity to manipulate the physical structure of the environment that field studies do not. Given that simulated environments will have to be used in the research studies for this thesis, measuring perceived restoration appears an appropriate and convenient technique.

Of the measures of perceived restoration identified, Han’s (2003) SRRS appears most appropriate because it includes emotional, physiological and cognitive dimensions that feature prominently in both theories of restoration. With the effects of danger on restoration (both actual and perceived) being a relatively unexplored area, it is hoped that the broader nature of the SRRS as opposed to more focused measures such as the PRS will provide a deeper and more interesting insight. Furthermore the inclusion of a behavioural dimension is particularly important when one considers the effects of danger in an environment. Both SRT and ART imply some form of behavioural tendency in the form of approach or avoidance behavior, with restorative environments eliciting approach and exploration (Han, 2003). In terms of SRT, an individual chooses to stay in a restorative environment because it is a source of solace and refuge from stress. In terms of ART, involuntary attention is engaged through fascination in a restorative environment and so the individual feels compelled to explore the environment. However in most cases, danger is not a good thing. Humans have learnt to try and avoid danger and so if confronted by danger are likely to try and escape it. Danger or the threat of it is therefore highly likely to result in avoidance behaviour rather than the approach behaviour that may foster restoration e.g. the freedom to walk slowly and explore an environment. For these reasons, the SRRS will be selected for use in this thesis.

2.2.8 The use of simulations

The use of environmental simulations has become a widely accepted technique for use within the environmental psychology literature (Stokols, 1993). Practical
advantages of using a simulation include not needing to take people to the actual location and being able to expose people to the environment simultaneously and at any time of the day. The simulation technique also has important methodological advantages over the field technique including greater experimental control. This helps ensure that respondents and participants are exposed to the same environment. In a natural environment, there is a huge potential for variability in terms of weather, animals or people that may be encountered or the specific route taken. With the approach and design of this thesis being fairly experimental, ensuring people are exposed to the same environment is essential to compare the effects of danger when either it or the physical structure of the environment is manipulated.

However simulation techniques have invariably raised questions regarding ecological validity because simulations restrict people to only experiencing visual characteristics whilst other aspects that may be considered integral to the restorative experience such as smell and touch are lacking. Furthermore simulation techniques make it difficult to capture an intrinsic motivation in an experimental setting (S. Kaplan, 2001). Such a motivation is an important factor in real-life restorative experiences because it reduces the ‘costs’ of dealing with demanding situations. Instead experimental settings typically offer an extrinsic reward in the form of monetary rewards and as a result, the intrinsic motivational aspect of restorative experiences is absent. However the use of simulations would only make it harder to detect any real effects and given the congruence in findings between simulation and field experiments comparing natural and urban environments, the simulation technique has become a largely acceptable method of investigating restorative experiences.

When using simulation techniques, a recent study by de Kort et al. (2006) demonstrated that a more immersive projection of a mediated natural environment using a larger screen had stronger stress reducing effects on physiological measures such as heart rate and skin conductance than a less immersive projection. These results suggest that a more immersive projection enhances the restorative potential of a mediated natural environment and therefore to detect any real effects using a simulation method, a high level of immersion should be used.
As has already been stated, the use of simulated environments will almost invariably have to be used as part of this thesis when manipulating and exploring the effects of danger. There are several advantages of using the simulation technique particularly in regard to experimental control which is important for the experimental approach of this thesis. It has proved a popular and successful technique within the restoration literature despite running the risk of making it harder to detect a real effect. In order to help reduce this risk, it makes sense to try to use immersive and realistic simulations in any research that adopts the technique.

2.2.9 Critical review of restoration research

Although any environment can foster restoration, generally speaking, it appears that natural environments are particularly good at this. Research has continued to support this interpretation that natural environments better serve physiological, emotional and attentional restoration than urban environments (e.g. Berto, 2005; Cackowski & Nasar, 2003; Hartig et al., 2003; Kuo, Bacaicoa & Sullivan, 1998; Parsons et al., 1998). Indeed people’s moods are often more positive after experiencing natural environments rather than urban ones, whether experienced in person (e.g. Hartig et al., 1991; Hartig et al., 2003; Kaplan & Kaplan, 1989; Marselle, 2004) or through simulations (e.g. Hartig et al., 1996; Staats & Hartig, 2004; Ulrich et al., 1991). Natural environments also tend to be perceived as more restorative than their urban counterparts (e.g. Purcell et al., 2001; Staats & Hartig, 2004; Staats et al., 2003). There is also empirical evidence to suggest that people stereotype natural environments as having a higher restorative potential than urban environments (Grahn & Stigsdotter, 2003). This has led to an apparent assumption within the restoration literature that natural environments are more restorative than urban environments and almost unanimously highly restorative environments. But is this fair?

Firstly, there is no universal restorative environment. Environments, both stressful and non-stressful, interact with personal and social factors which can either worsen or improve restoration (Hartig, 1993). For some people, the stereotypical restorative environment is at home where one retreats to at the end of a long working
day. For others, it is a natural environment like a lake, where the stressors of modern life are far away. There is no universal restorative environment because although some may see the home as a restorative environment, for others, it is just another workplace full of domestic chores. Even natural environments such as the lake may become associated with negative features such as biting insects. The marginal utility of restoration of such places may well fade over periods of time spent in them, even for those who regularly seek them out for restoration. Therefore the restorative potential seen in a place varies between people and over time within any one person. No one environment can be restorative for all people at all times, and no one environment can be restorative for any one person all of the time. It is important to remember that the process of restoration is tied to some preceding deficit or deficits that require recovery back to equilibrium. When recovery has occurred, restoration can no longer be achieved. However an ongoing experience in the environment may still be psychologically beneficial, but any benefits are other than restorative.

Secondly, there is evidence to suggest that some compatible urban environments such as museums (Kaplan, Bardwell & Slakter, 1993) and monasteries (Ouellette et al., 2005) can also be restorative. Indeed Ouellette et al.’s (2005) study investigating the restorative effects of a monastery found that meditation can serve a restorative role and can be facilitated by the content and process dimensions identified in natural environments. Other urban environments may support restoration because they are readily accessible and fit within the limited time budgets of many urbanites (Scopelliti & Giuliani, 2004). It is therefore important to acknowledge that not all urban environments are incapable of restoration of physiological or psychological capabilities.

Thirdly, the choice of environments in studies comparing the restorative effects of natural and urban environments has been somewhat biased towards the restorative effects of nature by contrasting natural environments with stressful urban environments that possess little restorative potential e.g. commercial and industrials areas (Ulrich et al., 1991). It is not just the choice of urban environment that seems a little unfair, but the choice of natural environment. The natural environments typically chosen are pleasant, open and full of restorative natural features that help reduce stress and invoke involuntary fascination (e.g. flowers, water, and natural light). Other natural
environments exist that may not contain such abundant restorative properties. Instead they may be dark, enclosed environments with obstructive vegetation. Such places may prove intimidating rather than therapeutic (Milligan & Bingley, 2007). Although this thesis will not compare natural and urban environments, this does raise the important point that instead of being restorative, some natural environments may actually be perceived as dangerous.

2.3 PREFERENCE FOR NATURAL ENVIRONMENTS: THE LINK TO RESTORATION

A further line of research has explored the restorative qualities of favourite places (Korpela, Hartig, Kaiser & Fuhrer, 2001) and the “places people take their problems” (Francis & Cooper-Marcus, 1991). In early studies that examined the experiences people felt in favourite places, the overlap between the experiences described and the experiences of interest to restorative environments theory were noted (Korpela, 1991). Research into the qualities of favourite places has demonstrated that natural environments are typically over represented among favourite places, underrepresented among least favourite places, and that restoration is particularly typical of natural favourite places (Korpela et al., 2001). Lower levels of fear arousal are associated with favourite places whilst higher levels of fear are associated with least favourite places (Korpela & Hartig, 1996). Therefore it seems that natural environments not only tend to be highly restorative environments, but they are preferred because of it.

2.3.1 The evolutionary preference for nature

Wilson (1984) coined the term ‘biophilia’ and hypothesised that humans have a fundamental and genetically based need to affiliate with nature because it typically affords survival. From a phylogenesis perspective, a similarly innate positive biological response to urban environments did not develop because human beings did not develop in urban environments. According to evolutionary accounts, human beings started to live
on the savannas of East Africa around 2 million years ago. During this time, specific features of the landscape became associated with affording survival. For example, bodies of water not only serve a physical necessity, but also act as a perimeter defence from enemies. The presence of water also attracted other animals and plant life on which humans are dependent. Prominences overlooking grasslands became associated with survival as they afforded views of approaching threats such as predators or the weather. Recent work has successfully demonstrated this supposed implicit preference for nature by using the implicit association task (e.g. Mastandrea et al., 2008; Schultz, Shriver, Tabinico & Khazian, 2004). For example, Mastandrea et al. (2008) characterized this preference for nature by finding significantly shorter reaction times to group positive words and natural environments than to group negative words and natural environments.

Generally speaking, environments with less built elements, more distant views, little underbrush vegetation, topography change and clear water body present receive higher preference ratings (Daniel & Bolster, 1976; Kaplan & Kaplan, 1989; Steinitz, 1990; Zube, Pitt & Anderson, 1975). According to Kaplan and Kaplan (1989), such landscapes ‘can be called parklike, woodlawn or savannah’ p. 48) and are preferred because as a result of evolution, have become perceived as the most survivable. They also found that respondents consistently reported lowest preferences for scenes that were blocked in prospect and contained features such as dense tangled understory vegetation. These findings could not be attributed to alternative explanations such as race, knowledge about an environment or environmental upbringing.

Orians and Heerwagen (1992) decided to test biophilia and the savannah hypothesis by positing that if it was indeed true, then people should respond in a positive manner to savannah-like environments even in the absence of direct experience. In their cross-cultural study, they found that all groups tended to prefer the savannah-like tree the most, characterised by moderately dense canopies and trunks that bifurcate near the ground. Trees that had high trunks and very dense or sparse canopies were consistently least preferred. This provides further empirical support for the tendency for humans to prefer savannah-like environments and suggests that this preference is or has become innate in humans.
Ulrich (1993) claims that the presence of lush forest growth and clear flowing water evokes perception of a favourable environment that affords human survival by providing the necessities of water, food and refuge and this is why they are typically preferred. He suggests that it is therefore unsurprising that the savannah and park like environments that have become associated with human survival and tend to be preferred because such landscapes nurture the human physiology, promote a sense of emotional well-being and produce the greatest restorative effects. This human ecology approach acknowledges that a dynamic relationship between people and environment exists, whereby humans are only one part of a larger functioning ecosystem. Human ecology advocates that people, given a choice, will reveal a tendency to prefer environments that amplify their ability to survive and thrive, and that are healthy and supportive of life processes (Appleton, 1975; Kaplan & Kaplan, 1989). Natural environments are typically better equipped than urban environments to support these life processes and so this is why they tend to be preferred (Kaplan, 1995).

2.3.2 The link between preference and perceived restoration

Purcell et al. (2001) even suggests that preference judgements are made using the perceived restorative value of an environment as an implicit frame of reference. Using five different environments ranging from industrial to lakeland, the study found a fairly strong positive correlation of .81 between preference judgements and scores on the PRS (Hartig et al., 1997a). A similar strength correlation between preference and the PRS was found by Ivarsson and Hagerhall (2008) when comparing two different gardens. These studies have typically measured preference for an environment relative to other environments. Other studies have chosen to use beauty ratings to measure preference (e.g. van den berg et al., 2003) and have found a much more moderate positive correlation between preference and perceived restoration. The use of beauty ratings to measure environmental preference is empirically justified, e.g. Zube et al., 1975, who demonstrated a strong convergence between beauty items and items measuring preference in relation to other environments. One apparent explanation as to why the strength of the positive correlations between perceived restoration and preference found
by these studies varies is because different measures have been used. A clear rationale for choosing Han’s (2003) SRRS has been provided and so a clear and consistent idea of how preference will be measured in this thesis is also needed. As both beauty items and preference judgements relative to other environments have been used by existing research, the researcher feels that a combination of the two approaches represents a valid and reliable way of measuring environmental preference.

It is also worth noting that the finding of co-variation between preference and restorativeness does not necessarily indicate a causal relationship and other variables could mediate the relationship. Social contact may be one possible explanation for this. Staats and Hartig (2004) were unable to find a general effect of company on both preference and restoration. The absence of an effect was attributed to two opposed effects where company enhanced restoration when safety was a concern, whilst solitude enhanced restoration when safety was controlled for. These results suggest that people find solitude more effective in restoring attentional capacity than company providing the safety benefits that company may bring is already secured. Both SRT and ART advocate that restoration is a process that one experiences in solitude in an environment that facilitates recovery from stress or mental fatigue where company may be an unwelcome distraction from the physical environment (cf. Kaplan, 1995). For individuals who are feeling stressed or cognitively depleted, environments that foster restoration should have greater utility (Ulrich, 1983). One would expect the positive relationship found between perceived restoration and preference would be even more pronounced for individuals who are stressed or suffering from mental fatigue because they are the most likely to benefit from the environment’s restorative potential (Ulrich, 1983). Indeed a series of studies by Staats, Hartig and their colleagues have tested this idea by manipulating attentional fatigue to examine how the attitude toward walking in a natural or urban environment varied with the need for restoration. The first two studies (Staats & Hartig, 2004; Staats et al., 2003) experimentally manipulated attentional fatigue by asking participants to imagine themselves as fatigued or alert. To address concerns for ecological validity, a third study (Hartig & Staats, 2006) used a naturalistic fatigue induction where participants participated in the experiment either before or after an attentionally depleting lecture. In all 3 experiments, after attentional fatigue had been
manipulated, participants took a simulated walk through a forest or city centre by watching a series of slides. They were then asked to rate how pleasant they would find the walk in their current mental state and to rate the likelihood of restoration given a 1 hour walk in the environment previously shown. The results of these three studies demonstrated that the attitude toward walking in the forest was more positive than the attitude for walking in the city. However in all three studies, attentional fatigue increased preference for natural over urban environments (Hartig & Staats, 2006; Staats & Hartig, 2004; Staats et al., 2003). These differences were attributable to a decrease in preference for the urban environments rather than an increase in preference for natural environments and restoration was deemed to be more likely to occur in the natural rather than the urban environment. Staats et al. (2003) claim that the greater likelihood of achieving restoration in the natural environment leads people to a more positive evaluation of the natural environment when attentionally fatigued. This may explain why the need for, and perceived likelihood of, restoration from attentional fatigue leads people to prefer natural over urban environments. However contrary to this explanation, Regan and Horn (2005) found that when asked to imagine a variety of mood states and express a preference for specific environments, a relaxed mood state produced more preference responses than a stressed mood state. In light of the previous literature discussed, one would expect a stressed mood state to produce the greatest number of nature preference responses because this is when nature would be of most utility. However in the majority of the environment sub-groups (e.g. green nature, wild nature, cultivated nature and natural water), green nature was found to be ranked first or second for preference in response to a stressed mood state. This study therefore still provides support for the idea that nature is primarily associated with relaxation but green nature may be sought more often than other types of nature such as wild nature, cultivated nature and natural water when imagining negative mood states.

So not only do natural environments typically provide us with numerous health benefits such as restoration, but the expectation of these benefits leads us to prefer these types of environments. But is it accurate to portray natural environments as environments that are always restorative and highly preferred? There is certainly a dark
side to nature that one might expect to oppose the positive side of natural environments that needs to be discussed.

2.4 THE DARK SIDE OF NATURAL ENVIRONMENTS

2.4.1 The social meaning of nature

Despite the health benefits we may expect from contact with natural environments, the meaning given to nature and our attitudes towards it has evolved greatly in Western society. Our early attitudes towards nature were heavily driven by Christianity and other social influences. In the Middle Ages, instead of being part of the natural world, humans saw themselves as spiritual beings constrained by flesh. Nature existed as a medium for God to reward or punish humans (Bede, 1968). In the precarious life of a peasant, nature became a threat to survival that evoked fear rather than feelings of comfort. In Dark Age Europe, unpenetrable dark forests contained wild animals (e.g. boar, bears, wolves) and bands of violent armed men where only the ‘well-armed, spiritually guided and courageous ventured’ (Burke, 1985). Many mythological connotations became associated with forest and woodland environments, with many of the fairytales learnt by children in the Western world located in these environments (Harrison, 1992). Fairytales such as Little Red Riding Hood and Hansel and Gretel originate from the 12th-15th Centuries, depicting these environments as a home of evil that needs to be avoided. Woods have become coupled with notions of danger, mystery and darkness that pose a clear sense of risk to women and children of becoming lost (Cloke, Milbourne & Thomas, 1996). It was not until the European period of enlightenment and increasing levels of urbanization that attitudes towards nature shifted away from being repulsed by nature towards fascination and trying to understand it.

The idea that the meaning and understanding of ‘nature’ is socially constructed is nothing new. Constructionist approaches such as that of Berger and Luckermann (1966) advocate that all knowledge, including our common sense of everyday reality is derived and managed by social interactions. Schama (1985) provides convincing arguments of how social meanings have developed to create different representations and meanings of
forests across different countries: a militaristic spirit in Germany; a trancendal connection with a ‘Creator’ in America; a struggle for national freedom in Poland. Within an English context, mapped-on meanings of forests as places to find oneself have developed as a result of histories of human liberties in the ‘greenwood’. Critics to the social constructionist argument (e.g. Whatmore & Boucher, 1993) warn of the fallacy of reducing nature purely to social relations by ignoring the biological and physical dynamics of life processes. These processes should be regarded as conceptually independent of human construction (Benton, 1989). Although the social constructionist argument does have its critics, forest and woodland does appear to have developed some slightly sinister connotations in Western societies and in particular the United Kingdom because of the dangers that may be perceived or actually present in such environments. These connotations could be of particular relevance to country parks, where forest settings account for around 30% of such environments in England (Countryside Agency, 2004).

2.4.2 Definition and implications of danger and fear

As has already been stated, danger is the potential for an individual’s physical, social or mental well-being to be harmed\(^a\) (Hale, 1996). Although there is considerable overlap between terms such as danger, threat and hazard, there are also some subtle differences between them that need to be clarified. A threat is a specific impending type of danger such as a person, object or event that results in a negative outcome. A hazard is usually regarded as a foreseeable but uncontrollable event or situation that has the potential to pose a threat to people (Kates & Kasperson, 1983). Most hazards are dormant or potential with only a theoretical chance of harm but may become active independently (e.g. volcano) or as a result of interactions (e.g. walking on an unstable path). A hazard may be animate (human or non-human); inanimate (weather, instability (e.g., glacier), water, fire, locomotion (e.g., cliffs); or take the form of an impediment

\(^{a}\) It is worth noting that the term safe or safety is often used within the environmental psychology to mean an absence of danger and so it will be treated as a direct antonym of danger within this thesis.
(natural, artificial) or deficiency (e.g., thirst) (Appleton, 1975, p. 96). Both a threat and a hazard are a source of danger, but a threat represents an active and immediate danger whereas a hazard appears to be more of a potential and foreseeable danger that when active, becomes a threat. When a hazard becomes a threat, exposure to it may result in a negative emotional reaction such as fear.

Fear is an unpleasant emotional state that is often triggered by the perception of threatening stimuli (Ruiter, Abraham & Gok, 2001). Fear involves both physiological and psychological responses. Physiological responses involve the activation of the amygdala and hypothalamus which then release adrenaline and the stress hormone cortisol into the bloodstream. Psychological responses include cognitive, affective, and behavioural responses directed towards the alleviation of the threat in conjunction with the reduction or elimination of fear (Dijkstra, Koomer & Gok, 1997; Frijda, 1986).

A cognitive aspect of fear is the association between a feared object and the situations where this fear may be encountered. For example a fear of becoming lost in the woods may develop which may motivate the individual to avoid large wooded areas (Bixler, Floyd & Hammit, 1995). The learning of fear may occur through direct experience, reinforcement or through instruction. Anecdotal evidence suggests that although some individuals may develop fear of natural environments such as wildlands through direct experience (e.g. being bitten by a snake, becoming lost etc.), the most frightened individuals are actually the ones with the least direct experience of such environments (Bixler, Carlisle, Hammitt & Floyd, 1994). This suggests that the generation of fearful perceptions of nature may be derived from messages from parents, peers and various media such as horror movies and news reports (Bixler & Floyd, 1997). In support of this idea, several studies have pointed to the negative portrayal of some of the most fear-evoking aspects of nature including snakes, insects and spiders in movies, books and cartoons (e.g. Hogue, 1987; Mertins, 1986; Moore, Bowers & Granovsky, 1982). It is not just fear-evoking aspects of nature that may be influenced. Assessments of perceived danger of assault may be made using information circulated by the media and the subsequent public discourse surrounding it. For example, reading crime-related tabloid front pages has been shown to be positively associated with avoidance behaviour and higher levels of perceived danger of becoming a victim (e.g. Smolej & Kivivuori, 2006;
Valentine, 1992). A publicised and widely discussed incident of danger within an environment may therefore heighten perceptions of danger and fearful reactions for an individual in that environment. Both theories of restoration imply that danger is not conducive to restoration. If this is the case, this could be extremely detrimental to supposedly restorative environments such as country parks whereby becoming associated with a dangerous or fear-evoking element may have negative implications for the restorative value of the environment. This is something that has not really been explored by previous research and is something this thesis will address.

2.4.3 Sources of danger and fear in natural environments

Natural environments typically contain a diverse range of threats including predators, venomous animals and lightning (Tooby & Cosmides, 1990). The prominence of spiders, snakes, insects are also capable of evoking fearful reactions (Bixler & Carlisle, 2004). Some researchers believe that fear responses to aspects of nature such as snakes and spiders are a result of evolutionary mechanisms. McNally (1987) states that fears of snakes, spiders and other pretechnical objects are overrepresented amongst the population indicating that humans have become biologically prepared to respond with fear and avoidance behaviour to natural stimuli that threatens survival. The processing of biologically prepared fear-relevant natural stimuli appears quick and often automatic (Ulrich, 1993). Seligman (1971) uses the term “biologically prepared” to describe modern human fears and phobias of such threats, while Ulrich (1993) uses the term biophobia. The “biological preparedness hypothesis” has received empirical support from controlled laboratory-based experiments typically using snakes as examples of evolutionary threats to survival (Öhman & Mineka, 2003). Fear of snakes is easier to learn and harder to unlearn than dangerous man-made threats such as guns and electricity outlets (Hugdahl & Johnson, 1989). Even if people are consciously unaware of the presence of snakes, the fear of snakes can be primed and learned (Öhman & Soares, 1993) whilst people’s attention is often grabbed by images of snakes in complex visual arrays (Öhman & Mineka, 2001). These studies further support evolutionary
accounts such as biophobia and the biological preparedness hypothesis that proposes fear of nature is compelled by evolutionary mechanisms.

On the basis of research with school children, Bixler and Floyd (1997) devised a list of nine typically-fear evoking situations in wilderness settings: seeing or stepping on a snake, getting bitten by a spider, being chased by a swarm of bees, being caught in a windstorm, being caught in thunder and lightning, getting lost, getting separated from friends, and not getting back before dark. Most of these situations appear to derive from evolutionary fears, but other aspects of the natural environment such as getting lost and the weather. Interestingly no social fears of phobias were included in the list. One possible explanation for this may be that on average fears directed towards animals onset at around 4 to 7 years of age whilst social phobias do not tend to emerge until around 18 years (Ost, 1987). However Bixler et al.’s (1994) study using urban students on field trips to wildland areas revealed that 33% of the respondents listed fear of strangers as a fearful reaction they had experienced on the visit. The emergence of such a social phobia amongst school students suggests that sources of social danger may be perceived at an earlier age than Ost suggests. The threat of being attacked by another person is still a realistic and prominent threat within a natural environment, particularly for women (e.g. Coble, Selin & Erickson, 2003; Henderson & Bialeschki, 1993) and the elderly (Jorgensen & Anthopolou, 2007). The fear of crime has been shown to be associated with differences in self-reported health, even after adjusting for health behaviours and other individual and household factors (Chandola, 2001). Even in more managed natural environments such as country parks, these different types of danger may still be present. Research demonstrating the fear of being attacked in open countryside, woodland and parks very much undermines the myth of ‘safe’ countryside, with the same muggers and rapists from urban environments being feared by users of such natural environments (e.g. Burgess, 1998; Koskela & Pain, 2000). This collection of research suggests that natural environments have the potential to contain a huge range of dangers and threats that may evoke fear. These include natural aspects such as animals and the weather, situational aspects such as getting lost and human aspects such as being assaulted or mugged. Within natural environments, people may hold one fear (e.g. becoming lost) or several fears (e.g. becoming lost, snakes, spiders, being attacked by another individual).
which may have an additive effect (Rachman & Lopatka, 1986). As previously stated, both theories of restoration would suggest that danger and the threat of it is not conducive to restoration. One may then infer that natural environments containing these dangers or those perceived as harbouring a threat of encountering these dangers will be less restorative. If people are able to accurately perceive the restorative physiological and psychological benefits that a restorative environment affords, such threats and danger also appear likely to reduce the perceived restorative value of an environment and mean that it is less preferred and avoided. The underlying assumption here is that danger invariably leads to fear and as such, does not encourage restoration. This may not always be the case.

2.4.4 The positive side of danger

In some instances, perceptions of danger and fear can be attractive e.g. extreme sports (Loeffler, 2004) and although the physical response to fear is universal, the emotional response to fear is highly individualistic. Adrenaline junkies participating in extreme sports and other fear-inducing thrill situations may perceive these types of fear in a positive manner. While this represents a rather radical example of positive responses to danger and fear, there is a small body of research to suggest that perceptions of danger may not always be detrimental to positive perceptions of an environment. Herzog and Smith (1988) made a distinction between physical danger (one that originates from the physical structure of the environment) and a social danger (one that originates from a human source). The distinction proved extremely valuable as only social danger was found to be a significant predictor (negative) of preference for an environment. Specifically within natural environments, the distinction between different types of danger appears extremely important. Outdoor recreation research has shown that some people may derive positive emotional and physiological experiences by overcoming sources of physical danger in awe-inspiring nature (e.g. Kaplan & Talbot, 1983). The isolation and lack of human influence and artificial boundaries characteristic of wilderness environments may evoke fear, but these same fear-evoking features also allow people to escape the confines and pressures of everyday life. People respond very
differently in response to these threats with some people responding with fear and other negative emotions (Ulrich, 1993), whilst others may experience positive and meaningful experiences in response to these natural threats (Kaplan & Kaplan, 1989). These positive responses to wilderness include increased energy, self confidence and feelings of awe that may lead to deeper thought and reflection of life (Ewert, 1986; Fredrikson, Annas, Fischer & Wik, 1996; Kaplan & Kaplan, 1989; Kaplan & Talbot, 1983). For these positive responses to occur, confrontations with natural threats and physical challenges are essential (Kaplan & Kaplan, 1989). Responses to natural threats in natural environments such as wilderness environments may therefore not necessarily damage people’s perceptions of that environment, but instead be dependent on whichever side of nature is psychologically more salient. Although wilderness environments are a far more extreme version of natural environments than country parks, there is supporting evidence from more fearful encounters in more everyday nature to challenge the idea that perceptions of danger are always detrimental to emotion, physiology and perceptions of an environment. Van den Berg and ter Heijne (2005) explored people’s fearful encounters with nature in environments including woodland, meadow and moorland. They found 41% of participants reported encountering both positive and negative emotions while 19% only reported positive emotions.

It is also worth considering that not all unpleasant natural stimuli results in fear. A growing body of research is also examining the disgust reaction to nature. Disgust is a less dramatic emotional reaction than fear, representing an emotional discomfort resulting from close tactile, olfactory, or visual contact with unpleasant stimuli (Angyal, 1941). Dirt, mud and plants and animals with tactile and visual properties such as softness, stickiness and sliminess may evoke disgust, and have been shown to be associated with lower preference for wildland environments and activities within them (Bixler & Floyd, 1997). Matchett and Davey (1991) claim that negative emotional reactions to certain small animals such as spiders may have both a fear and disgust element, whereas slugs, snails and ‘creepy-crawlies’ evoke only disgust reactions.

This collection of research suggests that there may be some positive side or at the very least, not as much of a negative effect of encountering physical dangers on emotion, physiology and perceptions of an environment. However to the researcher’s
knowledge, no positive effects on mood, physiology or perceptions of an environment have been documented in response to sources of a related social danger in a natural environment. Indeed Herzog and Rector (2009) found perceived restoration to be severely detrimentally affected by the imagined presence of a severe social danger. The distinction between different types of dangers therefore appears extremely important as different types of danger are likely to have different sized effects on elements integral to restoration and preference ratings for an environment.

2.4.5 Existing measures of danger within the literature

Blöbaum and Hunecke (2005) define perceived personal danger as “a general fear of becoming a victim, which is associated with specific social contexts, such as visiting a party or waiting for a bus.” This definition is somewhat confusing as it makes reference to fear which as discussed, is an emotional reaction and although the perception of danger or threat may be intrinsic to fear arousal (e.g. Frijda, 1986; Lazarus & Folkman, 1984; Zajonc, 1984), the former does not require the latter (Rogers, 1983). Therefore although one expects a congruent emotional reaction in conjunction with a cognitive appraisal of danger this may not always be the case. As already discussed, some people such as those participating in extreme sports may experience positive emotions rather than negative emotions such as fear from being in dangerous situations (e.g. Loeffler, 2004). Conversely fear must always be accompanied by a cognitive element (i.e. the cognitive perception of whether a situation is dangerous) as it is logically impossible to be afraid but not perceive the stimulus as dangerous (Gabriel & Greve, 2003).

Within the field of environmental psychology, a great deal of work investigating the relationships between perceived danger and other variables such as preference has been conducted by Herzog and his colleagues (e.g. Herzog & Chernick, 2000; Herzog & Kirk, 2005; Herzog & Kutzli, 2002; Herzog & Miller, 1998; Herzog & Smith, 1988). Although none of these studies have sought to define perceived danger, its measurement has always been done using one item that asks respondents to appraise the likelihood of coming to harm in general terms rather than from a specific threat (‘How dangerous is
this setting? How likely is it that you could be harmed in this setting?’). As one of the aims of this thesis is to explore the effects of perceptions of danger on restoration, there are two key issues with this technique that need to be addressed.

Firstly, some researchers claim that perceived danger does not just consist of likelihood estimates, but also consequences of danger (e.g. Menzies & Clarke, 1995; Williams, Turner & Peer, 1985; Williams & Watson, 1985) and the degree of control an individual feels they are able to exert on the situation (Rapee, 1997). The role of perceived control over a danger is particularly important for this thesis given that both the SRT and ART theories of restoration imply that a restorative environment affords some sense of control. Several of the factors in ART share a strong connection with the sense of control factor in SRT. In the case of compatibility, both sense of control and compatibility satisfy the need of the individual to feel comfortable within an environment by providing them an opportunity to tailor the environment to meet their needs. Without comfort in the shape of sense of control and compatibility, an environment cannot be restorative. Sense of control also relates to being away through providing an opportunity to escape from the everyday environments that causes stress and mental fatigue. By having the chance to step away from the distractions of a stressful environment, people have a choice to continue to stay in the stressful environment or seek restoration. As previously mentioned, people felt a sense of control just knowing that an open parkland space was nearby to escape to. Sense of control is also connected to extent. The interconnectedness aspect of extent enhances sense of control by offering a situation that is understandable. Incoherent environments require an individual to make sense of the environment and determine its suitability to satisfy their needs.

Secondly, dangers in natural environments stem from a number of threats and hazards that may not always result in negative emotions, physiology or perceptions of an environment. Therefore instead of measuring perceived danger in general terms, its measurement needs to be much more specific to the type of danger that could be encountered as different types of danger appear likely to differ in their perceived severity and ability to evoke fear that on theoretical grounds one could expect to disrupt the restoration process.
With the vast majority of existing research failing to make the distinction between different types of danger in an environment, their perception and effect is relatively unexplored. Furthermore the use of purely perceived likelihood estimates mean that the role of other factors integral to perceptions of danger such as perceived severity and control are also unknown. Therefore when measuring both perceptions of danger (i.e. a cognitive appraisal of danger in general terms) and threat (i.e. a cognitive appraisal of specific potentially encounterable threat), the research conducted as part of this thesis will use likelihood estimates in conjunction with perceptions of severity and control.

2.4.6 Perceived danger and perceived risk

Perceived danger can cause people to avoid places they associate with personal risk (Keane, 1998). It is important to acknowledge that all things being equal, perceived danger should equal actual danger. However in reality, personal factors, physical features and social factors may result in a different perception of danger than the actual danger. The assessment of risk may also share considerable overlap with perceived danger. However there is no unequivocal definition of risk because the various theoretical and methodological perspectives (e.g. Engineering, Geography, Economics, Sociology, and Psychology) that have addressed the issue have been unable to make a definition that is suitable for all problems (Fischoff, Watson & Hope, 1984). Common elements from these various perspectives suggest that perceptions of risk include value-judgements based on the probable occurrence of an event and its impact (Klinke & Renn, 2002; Renn, 1998). The lack of a clear definition and measure of perceived risk in conjunction with the overlap it shares with perceived danger and threat means that the inclusion of perceived risk is unlikely to further the quality of this research and may actually providing confusing. The term will therefore not be used in this thesis.

2.4.7 Individual differences in perceptions of danger: the role of gender
There are a number of individual differences that may one might expect to contribute to variations in the perception of danger and so need to be discussed. The most critical individual difference in how people respond to perceived danger is gender and gender role stereotypes (Box, Hale, & Andrews, 1988; Goodey, 1994; Haghihi & Sorenson, 1996).

In regards to social danger, the vast array of psychological and criminological research into fear of crime has almost unanimously claimed that women express more fear and greater perceived danger about being the victim of aggression and crime than men (Blöbaum & Hunecke, 2005; Box et al., 1988; Ferraro, 1996; Haghihi & Sorenson, 1996; Harris & Miller, 2000; Nasar & Jones, 1997; Riger, Gordon, & LeBailly, 1982; Warr, 1984). This fear may limit women’s freedom and movement around public spaces (Day, 1995; Keane, 1998; Suminski, Poston, Petosa, Stevens & Katzenmoyer, 2005). However questions used to measure fear of crime e.g. ‘‘How safe do you feel being out alone in your neighbourhood after dark?’’ may contain an inherent bias. Warr (1985) claims that asking women this type of question assesses a fear of sexual assault as opposed to a general fear of crime. He suggested that although women may be less often victims of offences such as assaults or robberies, they will much more often become victims of offences that are largely irrelevant for men such as sexual harassment and rape. Ferraro (1996) suggests that fear of sexual assault may “shadow” other types of non-sexual victimization such as burglary, robbery or assault because such crimes are often related to sexual offences (e.g. women are sometimes raped and assaulted during the same event). Therefore women may be typically more fearful of victimization because of their fear of rape and sexual assault in everyday life.

However there has been far less research directed towards gender differences in fear reactions and appraisals of perceived danger in response to natural threats and sources of physical danger. Fredrikson et al. (1996) conducted an investigation into gender differences for the phobic fears of nature. Their results found that compared to men, women were typically more phobic of animals (e.g. spiders and snakes) and situational aspects (e.g. lightning, darkness and heights). Other phobic fears such as dentists and needles revealed no significant differences. These findings suggest that when confronted with natural threats, women are more likely than men to respond
fearfully. In support of this, Van den Berg and Ter Heijne (2005) found that in response to descriptions of threatening encounters with nature that included falling objects, threatening animals and lightning, women responded with negative emotions and avoidance tendencies more often than men. Another study by Burger, Sanchez, Gibbons and Gochfeld (1998) that examined gender differences in recreational use found that men tended to engage in deeper interactions with the natural environment such as hiking, camping and fishing than women did. In addition, Katz (1993) claims that in the United States and other Western societies, a culture has developed whereby girls, unlike boys, are limited in their autonomy to explore outdoor natural environments due to societal pressures such as fears of abduction and injury. Consequently, a female population has developed that has been starved of exposure to nature and outdoor settings that is more unfamiliar and fearful of nature than the male population. This may partly explain results such as Virden and Walker (1999) who found that female college students were significantly more likely to perceive the forest environment as less safe, more inspiring and mysterious than their male counterparts. As a result the female students were found to prefer the company of a close friend or family member when in such environments but also preferred the environment to be more managed. In contrast to this, males were found to be less likely to prefer the company of others and to express a greater preference for more remote natural settings. Taking this research together, it seems that the greater unfamiliarity compared to men that many women have with the natural environment is likely to result in greater perceptions of danger, fear and the adoption of avoidance behaviours.

2.4.8 Gender differences in behavioural consequences of fear

In terms of the behavioural consequences of fear, women have been found to negotiate their fears using a variety of avoidance and defensive behaviours (Ferraro, 1996). For example, Mehta and Bondi (1999) examined the negotiation strategies of male and female university students in response to instances of physical or social danger in an urban public space. The results found that whilst women consciously resisted allowing the fear of violence to impact on their sense of autonomy, men represented
themselves as “in control” and physically proficient in an endeavor to preserve a sense of mastery. Indeed in an attempt to reduce the chance of physical attack, females undertook a series of defensive behaviours that included not walking alone, carrying rape alarms and taking self-defense classes. Coble et al. (2003) examined gender differences in negotiation strategies when hiking alone in natural environments and found that many of the fears identified were experienced by both male and female hikers. However men and women tended to experience these fears differently, expressing contrasting negotiation strategies to overcome their fears. Women as a group were more constrained by fear than men and engaged in more defensive and avoidance behaviours to overcome their fears. These behaviours included hiding off-trail when a stranger approached, planning their travel route and walking with a big dog. Conversely men were by and large less constrained by fear but primarily feared accidental injury or a potentially fatal emergency. To overcome these fears, men tended to adopt preventative behaviours and take precautions for adverse conditions including carrying an equipped first aid kit, topographical map of the area and leaving hiking itineraries with family. Interestingly these results broadly suggest that the primary source of perceived danger for women is from a social source (i.e. being attacked) whilst for men, the primary source of perceived danger stems from a more physical source (i.e. getting lost or having an accident). Once again, this highlights the importance of making the distinction between different sources of danger that may be encountered within a natural environment.

2.4.9 Underlying factors behind gender differences in perceptions of danger

So what are the underlying factors that may contribute to the commonly observed gender differences in perceived danger and in particular, fear of crime? Some researchers have adopted a non-evolutionary approach that postulates that women may be more fearful of crime because women are physically weaker than men meaning that they are less able to defend themselves against (typically male) perpetrators (e.g. Hale, 1996; Hines & Fry, 1994; Smith & Torstensson, 1997; Warr, 1984). This “vulnerability” approach suggests the relationship between gender and fear of crime is mediated by
differences in vulnerability. Using different objective and subjective measures of vulnerability (e.g. physical strength, self-confidence and the subjective ability to defend oneself from an aggressor), Killias and Clerici (2000) did find vulnerability to be associated with various indicators of fear of crime, however gender was found to always have a greater effect on fear of crime than vulnerability. These results indicate that vulnerability may not mediate the effect of gender on fear of crime. Furthermore the vulnerability argument would expect that because the higher fear of crime among women stems principally from their greater vulnerability, no gender differences in fear of events that may inflict physical injury regardless of vulnerability (e.g. car accident) should be found. Fetchenhauer and Buunk (2005) found that women were more fearful of all types of events that implied physical injury (ranging from robbery to being in a car accident) and concluded that these gender differences may have been a result of sexual selection that favoured risk-taking and status fighting amongst males, but a sense of caution and protection of one’s offspring amongst females. Indeed several other researchers have suggested an evolutionary biological bias for women to behave in a more cautious and less aggressive fashion except in defense of their offspring (Hines & Fry, 1994). These findings suggest an evolutionary basis for the gender differences typically observed in levels of fear of crime. That is to say that fear of crime among women does not represent a real increased chance of being victimized and nor is it primarily linked to the risk of being raped. Instead, women generally seem more fearful of all kinds of events that might imply a physical injury because as a result of evolutionary mechanisms and sexual selection.

From a male perspective, there is evidence to suggest that men unconsciously suppress fear or even remain oblivious to any potential threat. Smith and Torstenson (1997) concluded that men reported lower levels of fear than women because men were less accurate in their perception of becoming a victim of crime. Even to themselves, male machismo may make it harder for men to admit that they are fearful or deficient protectors (Arch, 1993; Hines & Fry, 1994). The concept of masculinity includes features such as control, aggression, competition and physical strength. Day, Stump and Carreon (2003) suggest that public spaces and situations that challenge the concept of masculinity may generate fear. Furthermore compared to women, men appear to regard
aggression as more instrumental (Harris, 1995; Tapper & Boulton, 2000) and expectant of greater social support if aggression is used as a response (Harris, 1994). Therefore in response to a threat of attack, males may feel more willing and able than women to use aggression to protect themselves which may buffer feelings of fear. Sutton and Farrall (2005) found a significant negative association between fear of different types of crime and tendency to give socially desirable responses for men but not women. These results further support the notion that men are encouraged through the concept of masculinity to discount fear. As a result, the perception of danger from both social and natural sources is likely to be reduced amongst males. Conversely women are encouraged to display emotion and appear to exercise a greater sense of caution in response to such social and physical threats.

2.4.10 Individual differences in perceptions of danger: the role of personality

Safety concerns are partly a function of who the individual is, and this may account for variations in perceptions of safety/danger (Wang & Taylor, 2006). In terms of responses to natural threats, one important variable that may account for the individual differences observed is the personality trait of ‘sensation seeking’ (van den Berg & ter Heijne, 2005). Zuckerman (1994) defines sensation seeking as an individual’s desire to experience novel, complex and intense sensations. Existing research suggests that high sensation seekers prefer more risky activities such as adventure holidays (Eachus, 2004) and paintings of ‘gloomy’ nature with high levels of tension (Zuckerman, Ulrich & McLaughlin, 1993) than low sensation seekers. This line of research led van den Berg and ter Heijne (2005) to hypothesise that high sensation seekers, as measured using Zuckerman’s (1978) version of the sensation seeking scale, would experience threatening encounters with nature as more pleasurable and less threatening than low sensation seekers. Supporting this, the results of the study found that high sensation seekers responded less often with negative emotions and avoidance tendencies but instead tended to respond with positive emotions and more approach tendencies. Further research in responses to natural threats in wilderness settings has revealed the prevalent role that self-regulation may play in enabling people to overcome
their deeply rooted fears of the wilderness. Self-regulation refers to the ability of an individual to override their automatic behavioural responses and select different more appropriate behaviours (Baumesiter, Heatherton & Tice, 1994). In wilderness settings, people are typically conditioned to obey their primitive defensive instincts in order to survive. Over time people may learn and develop efficient self-regulation systems that overcome unwanted negative affect that they may experience in response to the natural threats present in wilderness environments. Those individuals with well-developed self-regulation skills have been referred to as ‘action-oriented individuals’; whilst those with less developed self-regulation skills have been named ‘state-oriented individuals’ (Kuhl, 1981). Using Kuhl’s (1994) Threat-Related Action Orientation scale (AOT), Koole and van den Berg (2005) found that action-orientation was positively associated with perceived beauty of wilderness whilst action-oriented individuals were more efficient at suppressing thoughts associating death and wilderness than state-oriented individuals.

An individual’s general anxiety-related traits may also impact on perceived danger. Spielberger (1975) distinguishes between a stable, trait-like anxiety and a temporary state anxiety. In its state form, perceptions of danger are immediately followed by an anxiety state reaction that may lead to coping strategies, the adoption of avoidance behaviour or psychological defence. Anxiety as a trait instead reflects fairly stable anxiety levels within an individual whereby high A-trait individuals are predisposed to perceive a situation as more dangerous. Blöbaum and Hunecke (2005) tested this predisposition within an urban public space and failed to find a significant main effect of trait anxiety on perceived danger leading them to conclude that perceived danger may be more influenced by other personal factors such as gender. However anxiety may still warrant further consideration because of the different types of danger and environment that will be used in this thesis.

2.5 THE EFFECTS OF PERCEIVED DANGER AND FEAR ON PREFERENCE AND RESTORATION

A consistent negative relationship has emerged between perceived danger and preference in urban environments (e.g. Blöbaum & Hunecke, 2005; Fisher & Nasar,
1992; Herzog & Flynn-Smith, 2001; Herzog & Miller, 1988; Nasar & Fisher, 1993). A similar relationship has been found within natural environments where the focus has been on how the physical features enhance fear and the subsequent impact on preference (e.g. Herzog & Kirk, 2005; Herzog & Kutzli, 2002; Herzog & Kropscott, 2004). From this empirical evidence, one can conclude that both perceived danger and fear will have a negative effect on preference.

However there has been very little work that has examined the effects of perceived danger or fear on restoration. Despite this, we can still infer both will have a negative relationship based on theoretical and empirical support. From an SRT perspective, the perception of danger is more likely to create stress than dispel it. This would disrupt the restoration process because restoration requires a calming environment devoid of stress that facilitates the replacement of negative emotion by positive emotion. In ART, the recovery of attentional fatigue requires amongst other things, a setting that is compatible to restoration. If it is not, the individual has to direct attention to overcome the incompatibility, thus disrupting the restoration process. In dangerous situations where one feels unable to cope, effortful attention would be directed on tasks such as vigilance and trying to figure out what to do (S. Kaplan, 2001). Given the high level of congruence between studies of actual and perceived restoration, one would also expect perceptions of danger to negatively impact on perceived restoration. A strong link between perceptions of danger and fear has already been discussed and in support of this argument, Herzog and Kutzli (2002) demonstrated a strong positive correlation ($r = 0.78$) between the two constructs within a forest environment. One can therefore expect fear to also have a negative relationship with perceived restoration.

Further indirect support for perceptions of danger and fear to have a negative impact on perceived restoration can be made from the negative relationships found between preference and perceived danger (e.g. Blöbaum & Hunecke, 2005; Fisher & Nasar, 1992; Herzog & Flynn-Smith, 2001; Herzog & Miller, 1988; Nasar & Fisher, 1993) and fear and preference (e.g. Herzog & Kirk, 2005; Herzog & Kutzli, 2002; Herzog & Kropscott, 2004). As has already been stated, a strong positive correlation between preference and perceived restoration has been found by several studies (e.g.
Ivarsson & Hagerhall, 2008); Purcell et al., 2001; van den Berg et al., 2003). It has even been suggested that preference judgments may be made using the perceived restorative value of the scene, with people preferring scenes that they associate with restoration because of the health benefits and positive changes that restoration brings (Purcell et al., 2001). Given this strong association between preference and perceived restoration, one may deduce that perceived danger and fear will have a negative impact on perceived restoration.

Of the extremely limited body of research to date that has examined perceptions of danger and perceived restoration simultaneously, Herzog and Rector (2009) found that the presence of a serious and potentially uncontrollable danger could damage the perceived restorative potential of a walk through a natural environment. Despite the study only focusing on the effect of a social danger manipulation, this does provide some empirical support for the theoretical grounds of assuming that perceived danger and fear will be detrimental to perceived restoration. But as earlier discussed, natural environments have the potential to harbour a range of different dangers, not all of which may result in negative outcomes and emotions such as fear. This may result in different sized effects on positive perceptions such as perceived restoration and preference. So although one may expect a general tendency for perceived danger and fear to be detrimental to perceived restoration and preference, the effects of specific types of danger on perceived restoration and preference is unknown. This thesis will address this important issue by making the distinction between different types of danger before exploring the effects they have on positive perceptions such as restoration and preference.

2.6 THE ROLE OF THE PHYSICAL STRUCTURE OF THE ENVIRONMENT IN POSITIVE AND NEGATIVE PERCEPTIONS OF AN ENVIRONMENT

Although Herzog and Rector’s (2009) study represents one of the first explicit attempts to explore the effects of perceptions of danger on restoration, their choice of simulation method inadvertently highlights the potential mediating role the physical
structure of the environment may play in perceptions of danger. Although a short
description of the environment was provided which respondents were asked to imagine
taking a walk through, it was fairly nondescript in regard to the physical characteristics
of the environment and was immediately followed by the danger manipulation. Because
no visual representation of the walk was presented, it is possible that respondents
imagined walking through different nature trails as a result of whether they were given
the social danger manipulation. For example, as the social danger manipulation involved
someone following them, respondents may have imagined walking through a nature trail
with a physical structure that facilitates following someone e.g. shadow, boundedness,
places to hide etc. Conversely those not given the manipulation may have envisaged a
more pleasant open nature trail. The perceived restorative values of these variations
themselves may differ, regardless of whether a danger is presented or not. Therefore the
results of the study may be questionable because the same walk through the nature trail
was not imagined by respondents as a result of their having either the social danger or no
danger manipulation.

2.6.1 Prospect-refuge theory

Prospect-refuge theory (Appleton, 1975) is one possible relevant theoretical framework
for studying the physical features of an environment that can manipulate perceptions of
danger and safety. As its name suggests, the theory consists of the two components of
prospect and refuge. Appleton (1975) claims that perceived levels of prospect and refuge
are determined by various physical or symbolic attributes of the surrounding
environment: “Any feature of situation which directly facilitates observation or
indirectly suggests an opportunity to extend the field of vision fits into the category of
prospect. Any which affords, or symbolically suggests an opportunity to hide or attain
shelter fits into the category of a refuge” (Appleton, 1975, p.85). The theory postulates
that humans prefer environments high in prospect and refuge because of their high
adaptive ability to afford survival from living hazards by offering early observation and
a chance to attain shelter. Features of both prospect and refuge have been implicated as a
positive predictor of danger reactions in urban (Nasar & Fisher, 1993; Nasar & Jones,
1997) and natural environments (Chapin, 1991; Herzog & Kirk, 2005; Herzog & Kutzli, 2002). However features that afford refuge also act as a potential hiding place for potential offenders. Both Warr (1990) and Hassinger (1985) have demonstrated a strong positive correlation between an individual’s level of fear and the number of potential hiding places in the surrounding environment. These “lurk or blind spots” (Goffman, 1971) form an unknown part of the environment that an individual cannot see and are desired by offenders so that they can “wait, attack, and if need be, take the victim out of sight” (Fisher & Nasar, 1992). Although refuge may appear to play a somewhat paradoxical role in perceptions of an environment, Appleton (1975) offers a clear distinction between primary and secondary refuge. According to Appleton (1975), primary refuge refers to the view from within a hiding place while secondary refuge refers to the view of a hiding place from a vantage point outside it.

Incorporating Appleton’s (1975) prospect-refuge theory, Fisher and Nasar (1992) created a general typology for evaluating an individual’s perception of safety based on the individual’s level of prospect and the level of secondary refuge (i.e. for a potential offender). Fisher and Nasar (1992) also cite Archea’s (1985) access exposure model and argue that the degree to which a space affords an opportunity to escape a potential attack also plays a pivotal role in an individual’s perception of safety. Specifically, if little or an impeded escape is offered, then an individual is more likely to perceive it as unsafe because of the diminished ability to escape a potential attack. Both field research and simulation techniques using Fisher and Nasar’s (1992) typology has supported their claims, with environments low in prospect and escape for potential victims, but high in refuge for potential offenders, being perceived as less safe than environments high in prospect and escape for the potential victim but low in refuge for the potential offender (Fisher & Nasar, 1992; Nasar & Jones, 1997; Petherick, 2000/2001; Wang & Taylor, 2006). These studies however have only examined the influence of Fisher and Nasar’s (1992) typology of prospect-refuge solely within urban environments such as university campuses and alleys. This raises an interesting theoretical implication: can the typology be successfully applied outside of typically dangerous urban environments?
2.6.2 Applying Fisher and Nasar’s (1992) typology of prospect-refuge to a natural environment

Although the typology is yet to be tested within natural environments, there appears no reason why it would not form an applicable framework to understand perceptions of danger in such environments. Firstly, the threat of being attacked by another person is still a realistic possibility within a natural environment, particularly for women (e.g. Coble et al., 2003; Henderson & Bialeschki, 1993). Secondly, Bixler and Floyd’s (1997) list of nine typically fear-evoking situations within a natural environment is heavily loaded towards situations with evolutionary significance (e.g. stepping on a snake, getting bitten by a spider, being chased by a swarm of bees). Given that Fisher and Nasar’s (1992) model incorporates Appleton’s (1975) prospect-refuge theory which itself is heavily evolutionary driven, it appears that prospect, refuge and escape are all relevant dimensions when trying to understand how the environment may contribute to perceptions of physical as well as social danger. For example, high levels of prospect and escape combined with low levels of refuge would help an individual identify and avoid stepping on a snake and consequently, one would expect such an environment to be perceived as less dangerous than a similar one with little prospect and escape whilst heavy levels of vegetation may conceal a snake. Impeded prospect, high levels of refuge and restrained accessibility also appear likely to hide physical features that could cause serious harm or injury such as unstable paths, ravines that one could fall into or obstacles that could be tripped over.

These examples of social and physical danger represent a sudden danger forced upon the individual where the physical structure of the environment may or may not, provide warning or facilitate escape. It is this type of danger that the prospect-refuge model is built upon. One may therefore question the applicability of the model to perceptions of becoming lost which is clearly a less imminent and forceful danger. However the fear of becoming lost or disoriented in a natural environment is a very real one (Bixler et al., 2004; Coble et al., 2003; Kaplan & Talbot, 1983) and its contribution to perceived danger and effect on perceived restoration should be examined. There also appears to be some research to suggest that the prospect-refuge model could be applied
to the danger of becoming lost. Scenes low in prospect-refuge may provide few visual landmarks and afford low movement ease. Herzog and Kropscott (2004) demonstrated that both these factors were significant independent predictors of legibility which in turn was a significant predictor of perceived danger. Therefore scenes low in legibility may prove disorientating and be associated with a greater chance of becoming lost.

Thirdly, there has been a recent flow of research that has examined the physical properties of forest settings and their subsequent impact on perceptions of safety. Consistent with Fisher and Nasar’s (1992) typology, Herzog and Kutzli (2002) concluded that visibility (or prospect) and locomotor access (or escape) were negative predictors of danger within a series of forest settings. Furthermore, it has been demonstrated that impressions of safety are more strongly influenced by locomotive rather than visual permeability (Stamps, 2005). Openness (Herzog & Chernick, 2000) and border visibility of pathways and visual access have also been found to be negatively related to danger (Herzog & Kirk, 2005). Therefore within forest settings, it appears as though visibility is of paramount concern in evaluative reactions, with low visibility being appraised as more dangerous. This collection of recent research, predominantly by Herzog and his colleagues, appears to suggest that Fisher and Nasar’s (1992) typology could be applied to natural environments, particularly forest settings which account for around 30% of country park environments in England (Countryside Agency, 2004). Despite differing levels of prospect and escape within natural and more specifically forest environments being shown to elicit different perceptions of danger, the impact of these perceptions on preference and in particular perceived restoration, has gone largely unexamined. The closest existing research has got to examining how specific physical features of the natural environment impact on perceived restoration is from Staats et al.’s (1997) study examining the effects of density and accessibility on mood. The study found that low levels of accessibility (manipulated by a path or no path) resulted in the lowest reported levels of pleasure. Given that restoration is not solely confined to emotion, further investigation into the area is required.
2.7 SUMMARY OF LITERATURE REVIEW

From the reviewed literature, we know that contact with natural environments typically results in numerous physiological and psychological benefits, some of which fall under the category of restoration. Although any environment can be restorative, it appears as though natural environments are particularly suitable for this and the expectation of these benefits often results in high levels of preference for such environments. At a time of increasing mental health problems and physically inactive lifestyles amongst the population, natural environments are increasing valuable assets for public health strategies because of the physiological and psychological benefits they typically provide. Specifically within the United Kingdom, country parks are examples of natural environments that are readily accessible and frequently visited. However, natural environments such as country parks may contain a number of different dangers that can be detrimental to the physiological and psychological benefits of contact with nature. However, this topic has been largely ignored by existing research. Given that the success of any public health strategy that incorporates a natural element such as country parks is partly dependent on the restorative value of such environments, it is important to understanding the effects of perceptions danger. Natural environments contain a variety of dangers and threats that stem from physical, social and situational sources. The distinction between different types of dangers has also been largely ignored by previous research but is extremely important as different types of danger may result into different reactions and experiences. The physical structure of the environment also appears likely to play an arbitrating role in the perception of danger, with increasing levels of prospect-refuge (as defined by higher prospect and accessibility but lower refuge or hiding places for a potential attacker) likely to be perceived more favourably. Understanding the role that it may play in the perception of different types of danger and the subsequent effect it has on positive perceptions of a country park not only poses important theoretical implications, but also practical implications for the design and management of such environments so that their restorative value is protected. Figure 2.1 summarises the expected relationships between the variables under investigation and covered in this review.
Fig. 2.1. Summary model of key variables under investigation

note: — indicates an expected positive relationship,
      – indicates an expected negative relationship
CHAPTER 3

THE EFFECT OF PROSPECT-REFUGE ON NATURE EXPERIENCES

3.1 INTRODUCTION

The aim of this study is to explore how variations in the physical structure of the environment according to Fisher and Nasar's (1992) typology can influence both positive perceptions (preference and perceived restoration) and negative perceptions (overall danger, specific dangers and fear) within a specific example of a natural environment. It also aims to explore the underlying relationships between these perceptions.

Summary of relevant research

From the reviewed literature covered in the previous chapter, we know that natural environments tend to be examples of highly preferred environments that afford numerous physiological and psychological health benefits. Within the United Kingdom, one example of a readily accessible natural environment is a country park. These are managed public open spaces that have a natural, rural atmosphere and provide visitors with opportunities to engage in healthier lifestyles and participate in outdoor recreation and exploration of greenspace. The importance of these environments in facilitating good health and well-being is highlighted by their inclusion in public health strategies such as the Forestry Commission’s ‘Active woods – naturally good for you’ campaign. The effectiveness of these strategies is partially dependent on country parks being sought out for recreation and providing the restorative benefits contact with nature typically brings.

However, country parks and natural environments in general contain a diverse range of dangers and fear-evoking stimuli that one may expect to be disliked and be
detrimental to both the perceived and actual restorative benefits contact with nature normally provides. The threat of social danger in terms of physical or sexual assault in a natural environment is a very real one, particularly for women (Burgess, 1998; Coble et al., 2003; Henderson & Bialeschki, 1993). The weather, dangerous animals and falling branches are all examples of potentially fear-evoking physical dangers that may also be present within a natural environment (Bixler & Floyd, 1997; van den Berg & ter Heijne, 2005). A further danger that one could experience within a natural environment is becoming lost. Existing research suggests that the fear of this happening is a very real one (Bixler & Carlisle, 2004; Coble et al., 2003; Kaplan & Talbot, 1983). From this collection of research, this study distinguishes between three specific types of danger one could realistically encounter in a natural environment such as a country park – social danger, physical danger and the danger of becoming lost (lost danger). The distinction between different types of dangers is extremely important because not all dangers may be associated with negative outcomes and emotions. Previous research has demonstrated that when coming into contact with some sources of physical danger in a natural environment, people may experience positive as well as negative emotions (e.g. Kaplan & Talbot, 1983; van den Berg & ter Heijne, 2005). This leads to the possibility that not all types of danger could be detrimental to positive experiences within country parks or at the very least, the impact of different types of dangers may vary enormously.

*The effect of prospect-refuge*

Both field research and simulation techniques using Fisher and Nasar’s (1992) typology have supported its claims: environments low in prospect, that contain a high level of refuge for a potential offender to hide behind and offer an impeded escape for a potential victim are perceived as less safe/more dangerous, evoke more fear of crime and are less preferred than environments high in prospect, that contain a low level of refuge for a potential offender and offer a quick escape for a potential victim (e.g. Fisher & Nasar, 1992; Nasar & Jones, 1997; Petherick, 2000/2001; Wang & Taylor, 2006). However these studies have been largely confined to exploring perceptions within largely urban environments such as university campuses, alleys and urban parks. This
study attempts to examine the effect of Fisher and Nasar's (1992) typology on perceived danger, fear, preference and perceived restoration specifically within a country park. Despite the typology having not been explicitly used in a natural environment, there is a growing body of work by Herzog and his colleagues within natural environments that has demonstrated that the manipulation of perception and information-based variables can evoke significant differences in perceptions of danger. These variables include locomotor access and numerous visibility factors such as pathway curvature, openness and border visibility of pathways (e.g. Herzog & Chernick, 2000; Herzog & Kirk, 2005; Herzog & Kutzli, 2002). Research within natural environments has also indicated that people tend to prefer open meadows surrounded by woods (e.g. Zube et al., 1975). Consistent with Fisher and Nasar's (1992) typology, woodland that receives the highest levels of preference tends to be deciduous, with little underbrush and an absence of grass cover (Daniel & Bolster, 1976). In general, environments with less built elements, more distant views, topography change and clear water body present receive higher preference ratings (Kaplan & Kaplan, 1989; Steinitz, 1990; Zube et al., 1975).

The closest existing research has got to examining how specific physical features of the natural environment impact on perceived restoration is from Staats et al. (1997) who examined the effects of density and accessibility on mood. The study found that low levels of accessibility (manipulated by a path or no path) resulted in the lowest reported levels of pleasure. As restoration is not solely confined to emotion, further investigation into how the physical structure of a country park environment can contribute to perceptions of danger (both overall and specific sources of danger), fear and restoration (both perceived and actual) is needed.

In the current study, simulated walks through a country park that varied in prospect-refuge consistent with Fisher and Nasar's (1992) typology were developed to examine the effect of variations in prospect-refuge on perceived danger, fear, preference and perceived restoration. Higher levels of prospect-refuge were expected to result in significantly lower ratings of both perceived danger (hypothesis 1) and fear (hypothesis 2), but significantly higher ratings of both preference (hypothesis 3) and perceived restoration (hypothesis 4).
However as stated, natural environments contain a diverse range of dangers and the effect that the physical structure of a natural environment may have on an individual’s perception of how likely they could encounter these specific types of dangers is something that has been largely ignored by previous research. Elements of prospect, refuge and accessibility all appear likely to influence perceptions of how likely it is that one could encounter or fall victim to either a social danger or a physical danger. Fisher and Nasar’s (1992) typology has been shown to successfully explain how levels of prospect, refuge and accessibility contribute to feelings of safety from incidents of social danger within urban environments (e.g. Fisher & Nasar, 1992; Nasar & Jones, 1997; Petherick, 2000/2001; Wang & Taylor, 2006). The threat of being attacked by another person is a realistic possibility within a natural environment, particularly for women (e.g. Burgess, 1998; Coble et al., 2003; Henderson & Bialeschki, 1993). In this study we would therefore expect that respondents will perceive the likelihood of encountering a social danger to be greater in a low prospect-refuge environment than a high prospect-refuge environment (hypothesis 5a).

There also appears reason to expect a similar pattern in regards to the perceived likelihood of encountering a physical danger. Bixler and Floyd’s (1997) list of nine typical fearful-evoking situations within a natural environment is heavily loaded towards situations with evolutionary significance (e.g. stepping on a snake, getting bitten by a spider, being chased by a swarm of bees). Given that Fisher and Nasar’s (1992) model incorporates Appleton’s (1975) prospect-refuge theory which itself is heavily evolutionary driven, it appears that prospect, refuge and escape are all relevant dimensions when trying to understand how the environment may contribute to perceptions of the likelihood of encountering physical as well as social danger. For example, high levels of prospect and escape combined with low levels of refuge would help an individual identify and avoid stepping on a snake. Consequently one would expect such an environment to be perceived as more safe than a similar one with little prospect and escape whilst heavy levels of vegetation that may conceal a snake. Impeded prospect, high levels of refuge and restrained accessibility also appear likely to hide physical features that could cause serious harm or injury such as unstable paths, ravines that one could fall into or obstacles that could be tripped over. In this study we
would therefore once again expect that respondents will perceive the likelihood of encountering a physical danger to be greater in a low prospect-refuge environment than a high prospect-refuge environment (*hypothesis 5b*).

There also appears to be some research to suggest that variations in prospect, refuge and accessibility could be applied to the danger of becoming lost. Herzog and Kropscott (2004) demonstrated that both a lack of visual landmarks and a low level of movement ease acted as significant independent negative predictors of legibility, which in turn was a significant negative predictor of perceived danger. Therefore scenes low in legibility may prove disorientating and be associated with a greater chance of becoming lost. It is therefore expected that respondents will perceive a greater likelihood of becoming lost in a low prospect-refuge environment than a high prospect-refuge environment (*hypothesis 5c*).

*The relationships between variables*

Herzog and Kutzli (2002) found a strong positive relationship between perceived danger and fear in natural settings. Despite this, there is a clear distinction between emotional reactions such as fear and cognitive processes such as perceived danger. Although the perception of danger may be inherent to fear arousal (e.g. Frijda, 1986; Gabriel & Greve, 2003; Lazarus & Folkman, 1984; Zajonc, 1984), the former does not require the latter (Rogers, 1983). In some situations, a cognitive appraisal of danger may even be perceived as attractive (e.g. extreme sports) and not necessarily result in fear. Indeed confronting physical dangers and challenges within a natural environment may result in some positive emotions being evoked (e.g. Kaplan & Talbot, 1983; van den Berg & ter Heijne, 2005). It therefore makes both theoretical and intuitive sense to investigate both perceived danger and fear because they represent two distinct constructs.

The effects of both perceived danger and fear on preference have received a growing amount of attention in recent years. For the most part, the measurement of perceived danger in the environmental preference literature has focussed exclusively in terms of the perceived likelihood of coming to harm. Although this is an important
component of perceived danger, some researchers claim that perceived danger does not just consist of perceived likelihood ratings, but also consequences of danger (Menzies & Clarke, 1995; Williams et al., 1985; Williams & Watson, 1985) and the degree of control an individual feels they are able to exert on the situation (Rapee, 1997). Consequently the measure of perceived danger used in this study will incorporate perceived likelihood ratings of coming to harm in addition to perceptions of how severe and controllable any potential harm would be.

A consistent negative relationship has emerged between perceived danger (measured as the perceived likelihood of coming to harm) and preference within urban environments (e.g. Blöbaum & Hunecke, 2005; Fisher & Nasar, 1992; Herzog & Flynn-Smith, 2001; Herzog & Miller, 1988; Nasar & Fisher, 1993). Within natural environments, some of the focus has been on how physical features that enhance perceived danger and fear impact on preference (e.g. Herzog & Kirk, 2005; Herzog & Kutzli, 2002; Herzog & Kropscott, 2004). Generally speaking, these studies have found that physical features that are positively related to perceived danger and fear are negatively related to preference. This leads to the expectation that preference will share a negative relationship with both perceived danger (hypothesis 6) and fear (hypothesis 7).

The effects that perceived danger and fear have on restoration (both actual and perceived) have been largely ignored by previous research. Indirectly, the commonly found negative impact of perceived danger and fear on preference could also be found for perceived restoration because a positive correlation between preference and perceived restoration has been found by several studies (e.g. Han, in press; Purcell et al., 2001; van den Berg et al., 2003). It has even been suggested that preference judgments may be made using the perceived restorative value of the scene as an implicit frame of reference (Purcell et al., 2001). It therefore seems reasonable to expect perceived danger and fear to have a similar directional effect on perceived restoration. There are also theoretical grounds for making this assumption. From Ulrich’s (1983) SRT perspective, restoration requires a calming environment devoid of stress that facilitates the replacement of negative emotion by positive emotion. Perceptions of danger typically evoke stress and the process would invariably be disrupted. In ART (Kaplan & Kaplan,
the recovery of attentional fatigue requires amongst other things, a setting that is compatible to restoration. If it is not, the individual has to direct attention to overcome the incompatibility and this would disrupt the restoration process. In dangerous situations where one feels unable to cope, effortful attention would be directed on tasks such as vigilance and trying to figure out what to do (S. Kaplan, 2001). Given the high level of congruence between studies of actual and perceived restoration, one would expect perceptions of danger to also negatively impact on perceived restoration. It is therefore expected that perceived restoration will share a negative relationship with both perceived danger (*hypothesis 8*) and fear (*hypothesis 9*). However perceived restoration is expected to share a positive relationship with preference (*hypothesis 10*). Previous research has also suggested that trait anxiety or the perception of danger may affect perceptions of personal danger in urban environments with high A-trait individuals having a disposition to perceive situations as more dangerous (Blöbaum & Hunecke, 2005). Although in their study differences in trait anxiety (as measured by Spielberger’s [1975] STA-I) were not found to result in differences in perceived danger in urban environments, this study will be using a different type of environment and so the role of anxiety should at least be tested. In addition to ensuring that there are no significant differences in anxiety between the experimental conditions, the relationship it shares with other variables will be explored (*hypothesis 11*).

As previously mentioned, natural environments such as country parks contain a diverse range of potential dangers that very little previous research has tried to distinguish. Herzog and Smith's (1988) study using simulated urban alleys and narrow canyons distinguished between social and physical danger, with social danger defined as a danger stemming from a social source (e.g. being attacked by another person) while physical danger is defined as a danger stemming from the physical structure of the environment (e.g. being attacked by an animal, injury from tripping over obstacles, weather). The study found that only social danger was negatively related to preference. Although people may experience positive as well as negative emotions when encountering sources of physical danger (e.g. Kaplan & Talbot, 1983; van den Berg and ter Heijne, 2005), to the author’s knowledge, no positive emotions have been documented in response to social danger. It therefore appears a distinct possibility that
different types of danger may have different relationships with perceived danger, fear, preference and perceived restoration. Because perceived danger and preference have consistently been shown to be negatively related by Herzog and colleagues, it seems reasonable to expect a similar relationship with specific types of danger (despite the findings of Herzog and Smith, 1988). Perceptions of the likelihood of encountering the three specific types of danger (social, physical and lost) are therefore all expected to be positively related to both overall perceived danger (hypothesis 12) and fear (hypothesis 13), but negatively related to both preference (hypothesis 14) and perceived restoration (hypothesis 15).

Gender differences

There is also a substantial amount of research indicating significant gender differences in perceptions of danger and fear in response to both social and physical threats, with females tending to perceive higher levels of danger and fear and to adopt more avoidance tendencies than males (e.g. Fredrikson et al., 1996; Harris & Miller, 2000; Nasar & Jones, 1997; van den Berg & ter Heijne, 2005). Therefore significant gender differences are expected to be found with females expected to report significantly higher levels of perceived danger (hypothesis 16), fear (hypothesis 17) and the perceived likelihood of encountering specific types of danger – social (hypothesis 18a), physical (hypothesis 18b) and lost danger (hypothesis 18c) than males. Given these expected differences and the relationships perceived danger and fear are expected to have with preference and perceived restoration, significant gender differences in preference and perceived restoration are expected to be found. Females are therefore also expected to report significantly lower ratings of preference (hypothesis 19) and perceived restoration (hypothesis 20) than males.
3.2 METHOD

Respondents and design

Two hundred and sixty nine respondents consisting of undergraduate and postgraduate members of the University of Surrey Human Sciences department were recruited using a snowball sampling technique through the University’s social networking website (198 female; $M = 22.48$ years, $SD = 7.84$ years; 18-27 years). All respondents were United Kingdom residents and although no accurate response rate can be made, the sample was collected within 4 weeks of the initial call for respondents. Respondents were randomly assigned to one of three simulated environmental conditions that differed in levels of prospect-refuge according to Fisher and Nasar’s (1992) typology (low, $n = 90$; medium, $n = 89$; high, $n = 90$). This formed the single between-subject factor. Participation in the study was voluntary and no compensation was given.

Environmental simulations

The three environmental conditions were represented using a series of photographs that had been taken for this study in a country park in the south of England (The Queen Elizabeth Country Park near Portsmouth). The park contains a diverse range of habitats from calcareous grassland and yew woodland to coniferous and beech plantations spread over more than 1400 acres that can be explored by walkers, cyclists and horse riders. An initial set of 64 photographs were taken, all on a summer afternoon under sunny and clear weather conditions. To prevent any attention being drawn away from the landscape, photographs did not contain other human beings or animals.

For the manipulation of prospect-refuge, a small pre-test was conducted with 7 respondents consisting of five students and two alumni (4 female; $M = 32.15$ years, $SD = 8.16$ years; 20-56 years). Respondents were asked to sort the 64 photographs into one of three piles representing low, medium or high agreement in response to three independent questions measuring prospect (‘The extent your view is unobstructed to allow your field
of vision to extend deep into the scene’), accessibility (‘The ease in which you can move through the scene’) and the number of hiding places (‘The number of potential hiding places and opportunities for concealment’). Respondents sorted all 64 photographs a total of three times in response to the prospect, accessibility and hiding places questions. Photographs were shuffled between each sort and the order of the three questions was randomised between respondents to prevent order effects.

Each photograph’s mean rank for prospect, accessibility and number of hiding places was then created to allow the final slide selection to be made for each of the three environmental conditions. For the low prospect-refuge condition, the photographs that were ranked in both the bottom 20% for prospect and accessibility and the top 20% for hiding places were selected. For the medium prospect-refuge condition, the photographs that were all ranked in the middle 20% for prospect, accessibility and hiding places were selected. For the high prospect-refuge condition, the photographs ranked in both the top 10% for prospect and accessibility and the bottom 20% for hiding places were selected. This process resulted in 36 photographs equally divided between the three conditions being selected for the study. The 12 photographs that were chosen for each condition were arranged into a believable sequence with respect to landscape and light to depict a short walk through the environment (see Figs. 3.1, 3.2 and 3.3).

To help emphasise the physical structure of the environment, each condition was preceded by a short description of the physical structure and background to the walk that respondents were about to see in the photographs. Previous studies using simulated walks have used descriptions to help respondents better imagine taking the walk for real (e.g. Staats et al., 1997). Each description made indirect reference to levels of prospect, accessibility and hiding places by describing physical features such as light, vegetation, obstructions and pathways of the environment (see Appendix A).
Fig. 3.1. Photographs from the low prospect-refuge condition
Fig. 3.2. Photographs from the medium prospect-refuge condition
Fig. 3.3. Photographs from the high prospect-refuge condition

Measures

*Perceived danger* was measured using 3 items that were phrased to measure danger in general terms without reference to any specific type or source of danger: “How likely do you think it is that you could come to harm during your walk through this environment? How severe are the dangers you could potentially face walking through this environment? How well do you think you could control any potential dangers in this environment?” The response options ranged from 1 (*not at all*) to 7 (*very much so*) and
permitted a scale score after responses for the third item were reversed (mean response) that ranged from 1 (perceived as not at all dangerous) to 7 (perceived as very dangerous). The scale had a respectable level of internal consistency (Cronbach’s $\alpha = .73$) with an inter-item correlation of .48.

Fear was measured using 3 items: “How frightened would you be taking a walk through this environment? How scared would you be taking a walk through this environment? How uneasy would you be taking a walk through this environment?” The response options ranged from 1 (not at all) to 7 (very much so) that permitted a scale score (mean response) that ranged from 1 (perceived as not at all fear evoking) to 7 (perceived as very fear evoking). The scale had high internal consistency (Cronbach’s $\alpha = .93$) with an inter-item correlation of .92.

Social danger, as defined by Herzog and Smith (1988) as ‘danger that stems from a social source’ was measured using 3 items: “How likely do you think it is that you could be followed by a stranger in this environment? How likely do you think it is that you could be assaulted by a stranger in this environment? How likely do you think it is that you could be mugged by a stranger in this environment?” The response options ranged from 1 (not at all) to 7 (very much so) that permitted a scale score (mean response) that ranged from 1 (perceived as harbouring very little social danger) to 7 (perceived as harbouring a great deal of social danger). The scale had high internal consistency (Cronbach’s $\alpha = .94$) with an inter-item correlation of .84.

Physical danger, as defined by Herzog and Smith (1988) as ‘danger that stems from the physical structure of the environment’ was measured using 3 items: “How likely do you think it is that you could accidentally step on a snake in this environment? How likely do you think it is that you could become caught out in a violent thunderstorm? How likely do you think it is that you become injured by tripping over unseen obstacles?” The response options ranged from 1 (not at all) to 7 (very much so) that permitted a scale score (mean response) that ranged from 1 (perceived as harbouring very little physical danger) to 7 (perceived as harbouring a great deal of physical danger). The scale had an acceptable level of internal consistency (Cronbach’s $\alpha = .71$) with an inter-item correlation of .45.
Lost danger was measured using one item: “How likely do you think it is that you could lose your way and become lost walking through this environment?” The response options ranged from 1 (not at all) to 7 (very much so).

Preference was measured using 4 items that encompassed both beauty ratings and preference relative to other environments: “How pretty do you find this environment? To what extent do you like this environment? To what extent do you like this environment more than other natural environments you have visited? How beautiful do you find this environment?” The response options ranged from 1 (not at all) to 7 (very much so) and permitted a scale score (mean response) that ranged from 1 (not at all preferred) to 7 (very highly preferred). The scale had a high level of internal consistency (Cronbach’s α = .90) with an inter-item correlation of .69.

Perceived restoration was measured using Han’s (2003) self-rating restoration scale (SRRS) which consists of four dimensions (emotional, cognitive, physiological and behavioural). The scale consists of 8 items spread equally across the four dimensions with respondents being asked to indicate how much they agree with a statement using a 9-point likert scale with ratings ranging from 1 (not at all) to 9 (very much so) with higher ratings indicating greater perceived restoration. For the emotional dimension, the two items ask respondents to indicate how they would imagine feeling on two separate 9-point semantic differentials (Grouchy and good natured; Anxious and good natured), with higher ratings indicating more positive emotions. For the cognitive dimension, respondents were asked to indicate their perceived cognitive response (I am interested in the present scene; I feel attentive to the present scene). For the physiological dimension, respondents were asked to indicate their perceived physiological response (my breathing would become faster; my hands are sweating). The ratings on the physiological dimension are then reversed so that higher ratings indicate greater perceived physiological restoration. For the behavioral dimension, respondents were asked to indicate their perceived behavioral response (I would like to visit here more often; I would like to stay here longer). Individual dimension ratings were calculated by taking the mean response for that dimension. The overall perceived restoration score is then calculated by taking the mean average of the four dimensions, with higher ratings indicating greater perceived restoration.
The overall scale was found to have very high internal consistency (Cronbach’s $\alpha = .93$) with a mean correlation between the items of .63. Each of the four dimensions were also found to have a more than satisfactory level of internal consistency (Emotional, Cronbach’s $\alpha = .89$; Physiological, Cronbach’s $\alpha = .89$; Cognitive, Cronbach’s $\alpha = .76$; Behavioral, Cronbach’s $\alpha = .90$). Given that Kline (1998) regards reliability coefficients of around .90 as excellent, both the overall SRRS and the individual dimensions within it appears to be a reliable measure of the perceived restorative value of a natural environment.

The detailed initial model of the SRRS hypothesizes 4 dimensions and confirmatory factor analysis using SAS program using the data from all three conditions indicated a good fit between the hypothesized model and the collected data (see Table 3.1).

Table 3.1.

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<th>Model fit criteria of the SRRS</th>
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<td>$\chi^2$ (favourable value &lt;3.0)</td>
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Multicollinearity did not appear to be a problem as none of the six pairs of relations between each of the dimensions were found to be greater than 0.85. Values less than this can be considered as showing an acceptable level of discriminant validity (Kline, 1998). A good level of convergent validity was also demonstrated with high loadings (all $R^2 > .50$) of each set of variables on their common underlying factor.

Anxiety was measured using Spielberger’s (1975) STA-I trait anxiety measure. The STA-I consists of 20 positively and negatively worded items (see Appendix B) with response options that range from 1 (almost never) to 4 (almost always). Item scores are then summed to give an overall score that can then be compared with normal population groups with higher scores indicating higher levels of anxiety. The overall scale was found to have high internal consistency (Cronbach’s $\alpha = .89$) with a mean correlation between the items of .49.
Prospect-refuge manipulation check items were included to check that the manipulation of prospect-refuge was successful. One item was used to measure prospect “How clear is your view allowing your field of vision to extend deep into the scene?”; one item to measure accessibility “How easily do you think you could move through the scene?” and one item to measure the number of hiding places for a potential offender “How many potential hiding places and opportunities for concealment are there for another person?” The response options all ranged from 1 (not at all clear/ not at all easily/ very few hiding places) to 7 (very clear/ very easily/ many hiding places).

One item was used to ensure there were no significant differences in previous experience of visiting country parks between the three experimental conditions: “How often do you visit country parks?” The response options ranged from 1 (not at all often) to 7 (very often). Finally, to ensure the simulations were a realistic depiction of a walk within a country park, respondents were also asked the manipulation check item: “Do you feel the photographs and description just shown to be a representative example of a walk through a typical country park in the United Kingdom?” The ratings ranged from 1 (not at all) to 7 (very much so).

Procedure

An online questionnaire was developed for the study. Respondents were e-mailed an online link to the study that instructed them to complete it at the end of a fatiguing working day in a quiet environment without any distractions. Following a brief explanation of the study, respondents were randomly assigned to one of the three environmental simulation conditions. They were first given the short walk description and instructed to imagine they were taking the walk for real before the twelve photographs selected for the walk were presented. The photographs were presented as a slideshow, with each photograph displayed for 3 seconds before fading out and merging into the next one. The seven dependent measures (perceived danger, fear, social danger, physical danger, lost danger, preference and perceived restoration) were randomly split into three groups with each respondent completing each group of measures following reading the walk description and seeing the slideshow depicting the walk. This resulted
in the walk description and slideshow being shown a total of three times to respondents and was done so that it remained salient for respondents when they were completing the measures.

After completing the dependent measures, respondents were asked to complete the manipulation check items and indicate their age and gender. They were also given one free response question asking them to describe what they thought the biggest source of danger would be when walking through a country park environment alone (*What do you think would be the largest source of danger when walking through a country park alone?*). This was done to explore whether the three types of danger used in this study (social, physical and lost dangers) were all examples of a potentially perceivable danger within a country park.

### 3.3 RESULTS

*Manipulation checks*

As differences in environmental preference ratings have been shown to be a function of age, gender and landscape exposure (e.g. Lyons, 1983), it made sense to ensure that between-group differences were minimised and the groups were as homogenous as possible. No significant differences in age ($\chi^2 (2) = 0.22, p = .89$), gender ($\chi^2 (2) = 0.22, p = .90$) or experience of visiting country park environments ($F (2, 266) = 2.48, p = .09$) were found between the three conditions. There was also reason to expect that trait anxiety may have an effect on perceptions of danger and fear. Mean anxiety scores from the sample ($M = 41.27, SD = 9.93$) were of similar levels to normal adult population scores reported by Spielberger (1975) and no significant differences in anxiety were found between the three conditions ($F (2, 266) = 0.25, p = .78$).

The respondents indicated that they considered the slides to be largely representative of a walk through a country park in the United Kingdom ($M = 5.24, SD = 1.26$) and these ratings were not significantly different between the three conditions ($F (2, 266) = 0.62, p = .54$). The manipulation of prospect-refuge also appeared successful, with the mean ratings of prospect, accessibility and number of hiding places for another individual found to differ
significantly. Planned contrasts revealed the differences between conditions to be significant and in the direction expected (see Table 3.2).

Table 3.2.

Mean ratings (standard deviation) and ANOVA for prospect, accessibility and hiding places across the three prospect-refuge conditions

<table>
<thead>
<tr>
<th>Low</th>
<th>Med</th>
<th>High</th>
<th>Test of difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospect</td>
<td>4.83&lt;sub&gt;a&lt;/sub&gt;</td>
<td>4.07&lt;sub&gt;b&lt;/sub&gt;</td>
<td>3.43&lt;sub&gt;c&lt;/sub&gt;</td>
</tr>
<tr>
<td>(1.26)</td>
<td>(1.02)</td>
<td>(1.34)</td>
<td></td>
</tr>
<tr>
<td>Accessibility</td>
<td>3.59&lt;sub&gt;a&lt;/sub&gt;</td>
<td>5.25&lt;sub&gt;b&lt;/sub&gt;</td>
<td>5.86&lt;sub&gt;c&lt;/sub&gt;</td>
</tr>
<tr>
<td>(1.51)</td>
<td>(1.36)</td>
<td>(1.35)</td>
<td></td>
</tr>
<tr>
<td>Hiding places</td>
<td>6.03&lt;sub&gt;a&lt;/sub&gt;</td>
<td>5.35&lt;sub&gt;b&lt;/sub&gt;</td>
<td>4.81&lt;sub&gt;c&lt;/sub&gt;</td>
</tr>
<tr>
<td>(1.16)</td>
<td>(1.38)</td>
<td>(1.60)</td>
<td></td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly (p>.05).

Responses from the free recall question asking respondents to describe what they thought the biggest source of danger would be when taking the walks through the country park were coded into four different danger categories. Inter-rater reliability (percentage agreement of danger type between the author and an independent rater) was 93.1%. Boyatzis (1998, p. 156) claims that a minimum of 70% is typically considered an acceptable level in this type of research. As can be seen in Table 3.3, a substantial number of respondents reported a social or physical danger whilst the inclusion of lost danger also appears to be supported.
Table 3.3.

*Frequency counts and examples of the types of dangers respondents felt were the largest sources of danger walking through a country park environment*

<table>
<thead>
<tr>
<th>Danger category</th>
<th>Definition</th>
<th>Frequency and (% reported)</th>
<th>Examples included</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social</td>
<td>A danger that stems from a social source</td>
<td>92 (34.2)</td>
<td><em>Being followed by a stranger, male in 30s or 40s, stranger hiding waiting to attack, being mugged/assaulted, flashers</em></td>
</tr>
<tr>
<td>Physical</td>
<td>A danger that stems from physical structure of the environment</td>
<td>98 (36.4)</td>
<td><em>Animals: spiders, snakes, badgers, bees/wasps, deer with antlers during mating season, boar</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><em>Obstacles/hazards: tree branches, brambles, nettles, unseen tripping obstacles (e.g. tree roots, rabbit holes, ditches), rusty nails in fences</em></td>
</tr>
<tr>
<td>Lost</td>
<td>The danger of becoming lost/losing orientation</td>
<td>42 (15.6)</td>
<td><em>Unsure of location/direction to go for help, poor orientation</em></td>
</tr>
<tr>
<td>Other</td>
<td>A danger that does not fit into any of the previous categories.</td>
<td>5 (1.9)</td>
<td><em>Weather (thunderstorm/rain), losing communication from loss of mobile phone signal</em></td>
</tr>
</tbody>
</table>

Note: 32 respondent answers were either absent or deemed non-specific dangers.

*Effect of prospect-refuge*

To test the effects of prospect-refuge, four separate one-way between-subjects analyses of variances each with 3 planned contrasts (low vs. medium; low vs. high; medium vs. high) were conducted with prospect-refuge as the single between-subjects factor and perceived danger, fear, preference and perceived restoration as the dependent variables. The mean ratings for each of the dependent variables across the three prospect-refuge conditions along with planned contrast results are displayed in Table 3.4.
Table 3.4.

Mean ratings (standard deviation) for the three prospect-refuge conditions

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Danger</td>
<td>3.53a (1.45)</td>
<td>3.00b (1.27)</td>
<td>2.57c (1.25)</td>
</tr>
<tr>
<td>Fear</td>
<td>4.87a (2.52)</td>
<td>3.38b (2.10)</td>
<td>2.69c (1.89)</td>
</tr>
<tr>
<td>Preference</td>
<td>4.46a (1.28)</td>
<td>5.10b (1.08)</td>
<td>5.30b (1.00)</td>
</tr>
<tr>
<td>Perceived Restoration</td>
<td>4.58a (1.74)</td>
<td>5.99b (1.62)</td>
<td>6.65c (1.63)</td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly (p>.05).

Significant differences in perceived danger (hypothesis 1), fear (hypothesis 2), preference (hypothesis 3) and perceived restoration (hypothesis 4) were expected between the three prospect-refuge conditions. Increasing levels of prospect-refuge were expected to be perceived as less dangerous, less fearful, more preferred and perceived as being more restorative.

Supporting hypothesis 1, significant differences in perceived danger were found between the three prospect-refuge conditions \(F(2, 266) = 11.88, p<.001, \eta^2_p = .08\). Planned contrasts revealed that perceived danger ratings from the low prospect-refuge condition were significantly greater than for those from both the medium prospect-refuge condition \(t(266) = 2.69, p<.01, d = .33\) and the high prospect-refuge condition \(t(266) = 4.87, p<.001, d = .60\). The difference in perceived danger ratings between the medium and high prospect-refuge conditions was also found to be significant but slightly statistically weaker than the other two comparisons \(t(266) = 2.16, p<.03, d = .26\).

In support of hypothesis 2, significant differences in fear were found between the three prospect-refuge conditions \(F(2, 175.13) = 21.64, p<.001, \eta^2_p = .15\). Planned contrasts revealed that fear ratings from the low prospect-refuge condition were significantly greater than for those from both the medium prospect-refuge condition \(t(172.02) = 4.31, p<.001, d = .66\) and the high prospect-refuge condition \(t(165.21) = 6.58, p<.001, d = .67\). The difference in fear ratings between the medium and high prospect-refuge conditions was also found to be significant but slightly statistically weaker than the other two comparisons \(t(174.75) = 2.32, p<.03, d = .35\).
Supporting hypothesis 3, significant differences in preference ratings were found between the three prospect-refuge conditions \((F(2, 266) = 13.77, p<.001, \eta^2_p = .09)\). Planned contrasts revealed that preference ratings from the low prospect-refuge condition were significantly lower than for those from the medium prospect-refuge condition \((t(266) = -3.80, p<.001, d = .47)\) and the high prospect-refuge condition \((t(266) = -5.03, p<.001, d = .62)\). However the difference in preference ratings between the medium and high prospect-refuge conditions was not found to be significant \((t(266) = -1.22, p = .22, d = .15)\).

Supporting hypothesis 4, significant differences in perceived restoration were found between the three prospect-refuge conditions \((F(2, 266) = 36.35, p<.001, \eta^2_p = .22)\). Planned contrasts revealed that perceived restoration ratings from the low prospect-refuge condition were significantly lower than for those from the medium prospect-refuge condition \((t(266) = -5.67, p<.001, d = .70)\) and the high prospect-refuge condition \((t(266) = -8.24, p<.001, d = 1.24)\). Perceived restoration ratings from the high prospect-refuge condition were also found to be significantly greater than those from the medium prospect-refuge condition, although this difference was slightly less significant than the other two comparisons \((t(266) = -2.65, p<.01, d = .32)\).

The measure of perceived restoration used in this study allows it to be broken down into its four composite dimensions. Table 3.5 displays the perceived restoration ratings for each of the four dimensions across the three prospect-refuge conditions. Similarly to overall perceived restoration, highly significant differences across the three prospect-refuge conditions were found for all four dimensions of perceived restoration. Planned contrasts revealed the majority of differences between prospect-refuge conditions to be significant and in the expected direction \((p's<.05)\), with increasing levels of prospect-refuge resulting in higher levels of perceived restoration.
Table 3.5.

Mean dimension perceived restoration ratings (standard deviation) for the three prospect-refuge conditions and test of difference

<table>
<thead>
<tr>
<th>Dimension of perceived restoration</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>ANOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotional</td>
<td>4.45_[a]</td>
<td>5.95_[b]</td>
<td>6.77_[c]</td>
<td><em>F</em>(2, 266) = 33.43, <em>p</em>&lt;.001, η²_p = .20</td>
</tr>
<tr>
<td></td>
<td>(2.06)</td>
<td>(1.76)</td>
<td>(1.85)</td>
<td></td>
</tr>
<tr>
<td>Cognitive</td>
<td>3.72_[a]</td>
<td>5.08_[b]</td>
<td>5.97_[c]</td>
<td><em>F</em>(2, 266) = 33.43, <em>p</em>&lt;.001, η²_p = .20</td>
</tr>
<tr>
<td></td>
<td>(1.76)</td>
<td>(1.86)</td>
<td>(1.83)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.07)</td>
<td>(1.80)</td>
<td>(1.72)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.33)</td>
<td>(2.19)</td>
<td>(2.05)</td>
<td></td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly (*p*>.05).

To examine the effect of prospect-refuge on the perceived likelihood of encountering a social danger, physical danger or becoming lost, three one-way between-subjects analyses of variance, each with 3 planned contrasts (low vs. medium; low vs. high; medium vs. high) were conducted with prospect-refuge as the single between-subjects factor and the perceived likelihood of encountering the three specific types of danger as the dependent variables. Mean ratings for each of the prospect-refuge conditions are displayed in Table 3.6.

Table 3.6.

Mean ratings (standard deviation) for the three prospect-refuge conditions

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likelihood of social danger</td>
<td>3.60_[a] (1.64)</td>
<td>3.69_[a] (1.45)</td>
<td>3.27_[a] (1.53)</td>
</tr>
<tr>
<td>Likelihood of physical danger</td>
<td>3.27_[a] (1.17)</td>
<td>2.96_[b] (1.20)</td>
<td>2.71_[b] (1.06)</td>
</tr>
<tr>
<td>Likelihood of becoming lost</td>
<td>4.71_[a] (1.77)</td>
<td>4.36_[a] (1.65)</td>
<td>3.77_[b] (1.55)</td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly (*p*>.05).

Hypothesis 5a failed to be supported because no significant differences in the perceived likelihood ratings of encountering social danger were found between the three prospect-refuge conditions (*F*(2, 266) = 1.82, *p* = .16, η²_p = .01). Hypothesis 5b was
supported, with significant differences in the perceived likelihood of encountering physical danger found between the three prospect-refuge conditions \( F (2, 266) = 5.25, p < .001, \eta_p^2 = .04 \). Planned contrasts revealed that ratings of the perceived likelihood of encountering physical danger in the low prospect-refuge condition were significantly greater than for those from both the medium prospect-refuge condition, \( t (266) = 1.82, p < .05, d = .22 \) and the high prospect-refuge condition, \( t (266) = -3.23, p < .001, d = .40 \). However ratings of the perceived likelihood of encountering physical danger in the medium prospect-refuge condition were only found to be marginally significantly greater than those from the high prospect-refuge condition \( t (266) = 1.40, p = .08, d = .17 \). Supporting hypothesis 5c, significant differences in the perceived likelihood of becoming lost were found between the three prospect-refuge conditions \( F (2, 266) = 7.44, p < .001, \eta_p^2 = .05 \). Planned contrasts revealed only some of the differences in ratings of the perceived likelihood of becoming lost to be significant. Although ratings from the low prospect-refuge condition were only marginally significantly greater than for those from the medium prospect-refuge condition \( t (266) = 1.42, p = .08, d = .17 \) ratings from the low prospect-refuge condition were significantly greater than those from the high prospect-refuge condition \( t (266) = 3.82, p < .001, d = .47 \). The difference in the ratings of the perceived likelihood of becoming lost between the medium and high prospect-refuge conditions was also found to be significant \( t (266) = 2.39, p < .01, d = .29 \).

**Relationships between variables**

A series of simple linear regressions were conducted to examine how the variables were related to each other. As can be seen in Table 3.7, Spearman’s correlations revealed all of these relationships to be highly significant.
Table 3.7.
Spearman’s correlation matrix for the key variables under investigation (n = 269)

<table>
<thead>
<tr>
<th></th>
<th>Perceived danger</th>
<th>Fear</th>
<th>Preference</th>
<th>Perceived restoration</th>
<th>Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived danger</td>
<td>.69*</td>
<td>-.33*</td>
<td>-.65*</td>
<td>.10</td>
<td></td>
</tr>
<tr>
<td>Fear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preference</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived restoration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.09</td>
</tr>
</tbody>
</table>

* indicates significant correlation (all p’s < .001).

Perceived danger was hypothesised to positively predict fear (hypothesis 6) and negatively predict both preference (hypothesis 7) and perceived restoration (hypothesis 8). In support of hypothesis 6, perceived danger and fear were found to share a significant and strong positive relationship (Spearman’s ρ = .69, p < .001), with the overall regression model revealing a significant fit ($R^2_{adj} = 47.2\%$, $F (1, 267) = 240.32$, $p < .001$). In relation to hypothesis 7, a moderate significant negative relationship was found between perceived danger and preference (Spearman’s ρ = -.33, $p < .001$) but the overall regression model remained significant ($R^2_{adj} = 10.1\%$, $F (1, 267) = 31.27$, $p < .001$). Supporting hypothesis 8, a significant and strong negative relationship between perceived danger and perceived restoration was found (Spearman’s ρ = -.65, p < .001) with the overall regression model once again revealing a significant fit ($R^2_{adj} = 44.0\%$, $F (1, 267) = 211.21$, $p < .001$). Further examination using Fisher’s Z-transformation revealed perceived danger to be a significantly stronger negative predictor of perceived restoration than it was of preference ($Z = 7.86$, $p < .001$).

Fear was also hypothesised to negatively predict both preference (hypothesis 9) and perceived restoration (hypothesis 10). In relation to hypothesis 9, a strong negative relationship was found between fear and preference (Spearman’s ρ = -.51, $p < .001$) with the regression model revealing a significant fit ($R^2_{adj} = 25.4\%$, $F (1, 267) = 92.07$, $p < .001$). Supporting hypothesis 10, a significant and strong positive relationship between preference and perceived restoration was found (Spearman’s ρ = .56, p < .001), with the overall regression model revealing a significant fit ($R^2_{adj} = 73.3\%$, $F (1, 267) = 737.11$, $p < .001$). Further examination once again using Fisher’s Z-transformation
revealed fear to be a significantly stronger negative predictor of perceived restoration than it was of preference ($Z = 12.07, p < .001$). In terms of the effect on preference, perceived danger and fear were not significantly different ($Z = 0.73, p = .31$). However, fear was found to have a significantly stronger negative effect on perceived restoration than perceived danger ($Z = 3.34, p < .001$).

Supporting hypothesis 11, preference was found to positively predict perceived restoration with a significant and strong positive relationship ($\text{Spearman's } \rho = .56$, $p < .001$) and the regression model was found to be significant ($R^2_{adj} = 33.1\%, F (1, 267) = 133.82, p < .001$).

The role of trait anxiety was acknowledged as having the potential to influence perceptions of an environment (hypothesis 12). Using a series of linear regressions, analyses revealed anxiety failed to be a significant predictor of fear, perceived restoration or preference (all $p's > .05$) while it was only found to be a marginally significant predictor of perceived danger ($p = .07$). As can be seen in Table 3.7, anxiety was not found to correlate significantly with any of the variables under investigation.

Four multiple linear regressions were conducted with the perceived likelihood of encountering the three specific types of danger entered as predictor variables and either perceived danger, fear, preference or perceived restoration as the criterion variable. As can be seen in Table 3.8, Spearman’s correlations revealed all of these relationships to be significant.
Table 3.8.

**Spearman’s correlation matrix for the perceived likelihood of encountering social, physical and lost danger with the key variables under investigation (n = 269)**

<table>
<thead>
<tr>
<th></th>
<th>Social danger</th>
<th>Physical danger</th>
<th>Lost danger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived danger</td>
<td>.62</td>
<td>.40</td>
<td>.45</td>
</tr>
<tr>
<td>Fear</td>
<td>.54</td>
<td>.07</td>
<td>.30</td>
</tr>
<tr>
<td>Preference</td>
<td>-.30</td>
<td>-.08</td>
<td>-.26</td>
</tr>
<tr>
<td>Perceived restoration</td>
<td>-.53</td>
<td>-.12</td>
<td>-.47</td>
</tr>
<tr>
<td>Social danger</td>
<td></td>
<td>.30</td>
<td>.40</td>
</tr>
<tr>
<td>Physical danger</td>
<td></td>
<td></td>
<td>.35</td>
</tr>
</tbody>
</table>

All p’s < .001.

All three perceived likelihood ratings were hypothesised to be significant positive predictors of both perceived danger (*hypothesis 13*) and fear (*hypothesis 14*) and significant negative predictors of both preference (*hypothesis 15*) and perceived restoration (*hypothesis 16*).

Supporting hypothesis 13, the three perceived likelihood ratings of the dangers were found to share a significant and strong positive relationship with perceived danger (*Spearman’s ρ = .70, p < .001*). The overall regression model produced a significant fit ($R^2_{adj} = 47.8\%, F (3, 265) = 82.93, p<.001$) with all three perceived likelihood ratings being found to be significant positive predictors of perceived danger (see Table 3.9).
Table 3.9.

**Summary of multiple regression statistics for the predictor variables on perceived danger ratings**

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likelihood of social danger</td>
<td>.42</td>
<td>.04</td>
<td>.48</td>
<td>9.68</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Likelihood of physical danger</td>
<td>.17</td>
<td>.06</td>
<td>.14</td>
<td>2.74</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Likelihood of becoming lost</td>
<td>.21</td>
<td>.04</td>
<td>.25</td>
<td>5.02</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

B = Unstandardised beta coefficient, SE B = standard error, β = Standardised beta coefficient, t = t-test statistic, p = significance value.

Supporting hypothesis 14, the three perceived likelihood ratings of the dangers were also found to share a significant and strong positive relationship with fear (Spearman’s ρ = .59, p<.001). The overall regression model produced a significant fit ($R^2_{adj} = 34.3\%$, $F (3, 265) = 47.73, p<.001$) with only the perceived likelihood ratings of encountering social danger or becoming lost being found to be significant positive predictors of fear (see Table 3.10).

Table 3.10.

**Summary of multiple regression statistics for the predictor variables on fear ratings**

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likelihood of social danger</td>
<td>.67</td>
<td>.08</td>
<td>.44</td>
<td>7.98</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Likelihood of physical danger</td>
<td>.02</td>
<td>.12</td>
<td>.01</td>
<td>0.12</td>
<td>.90</td>
</tr>
<tr>
<td>Likelihood of becoming lost</td>
<td>.37</td>
<td>.08</td>
<td>.26</td>
<td>4.65</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

B = Unstandardised beta coefficient, SE B = standard error, β = Standardised beta coefficient, t = t-test statistic, p = significance value.

In relation to hypothesis 15, the three perceived likelihood ratings of the dangers were found to share a significant moderate negative relationship with preference (Spearman’s ρ = -.38, p<.001). The overall regression model produced a significant fit ($R^2_{adj} = 13.6\%$, $F (3, 265) = 15.05, p<.001$) but as can be seen in Table 3.11, only the perceived likelihood ratings of encountering a social danger or becoming lost were found to be significant negative predictors of preference.
Table 3.11.

Summary of multiple regression statistics for the predictor variables on preference ratings

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likelihood of social danger</td>
<td>-.14</td>
<td>.05</td>
<td>-.18</td>
<td>7.98</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Likelihood of physical danger</td>
<td>-.09</td>
<td>.07</td>
<td>-.09</td>
<td>0.12</td>
<td>.90</td>
</tr>
<tr>
<td>Likelihood of becoming lost</td>
<td>-.15</td>
<td>.05</td>
<td>-.22</td>
<td>4.65</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

B = Unstandardised beta coefficient, SE B = standard error, β = Standardised beta coefficient, t = t-test statistic, p = significance value.

Supporting hypothesis 16, the three perceived likelihood ratings of the dangers were found to share a significant and strong negative relationship with perceived restoration (Spearman’s ρ = -.61, p<.001). The overall model produced a significant fit ($R^2_{adj} = 36.2\%$, $F (3, 265) = 51.79$, $p<.001$) with only the perceived likelihood ratings of encountering social danger or becoming lost being found to be significant negative predictors of perceived restoration (see Table 3.12).

Table 3.12.

Summary of multiple regression statistics for the predictor variables on perceived restoration

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>B</th>
<th>SE B</th>
<th>B</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likelihood of social danger</td>
<td>-.50</td>
<td>.07</td>
<td>-.41</td>
<td>-7.60</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Likelihood of physical danger</td>
<td>-.01</td>
<td>.09</td>
<td>-.01</td>
<td>-0.01</td>
<td>.99</td>
</tr>
<tr>
<td>Likelihood of becoming lost</td>
<td>-.35</td>
<td>.06</td>
<td>-.32</td>
<td>-5.75</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

B = Unstandardised beta coefficient, SE B = standard error, β = Standardised beta coefficient, t = t-test statistic, p = significance value.

Gender differences

To examine whether any significant differences existed between males and females, a series of independent samples t-tests were conducted with gender as the grouping variable. The mean ratings and results of these tests are displayed in Table 3.13.
Table 3.13.

Mean ratings (standard deviation) and test of difference between males and females

<table>
<thead>
<tr>
<th></th>
<th>Male (n = 71)</th>
<th>Female (n = 198)</th>
<th>t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived danger</td>
<td>2.43 (1.13)</td>
<td>3.25 (1.40)</td>
<td>$t(151.76) = -4.94$, $p &lt; .001$, $d = .64$</td>
</tr>
<tr>
<td>Fear</td>
<td>2.39 (1.69)</td>
<td>4.10 (2.41)</td>
<td>$t(175.71) = -6.52$, $p &lt; .001$, $d = .82$</td>
</tr>
<tr>
<td>Likelihood of social danger</td>
<td>2.89 (1.28)</td>
<td>3.74 (1.58)</td>
<td>$t(151.09) = -4.52$, $p &lt; .001$, $d = .74$</td>
</tr>
<tr>
<td>Likelihood of physical danger</td>
<td>2.88 (1.13)</td>
<td>3.02 (1.18)</td>
<td>$t(267) = -0.84$,   $p = .40$, $d = .10$</td>
</tr>
<tr>
<td>Likelihood of becoming lost</td>
<td>3.97 (1.61)</td>
<td>4.39 (1.72)</td>
<td>$t(267) = -1.78$,   $p = .08$, $d = .22$</td>
</tr>
<tr>
<td>Preference</td>
<td>4.90 (1.04)</td>
<td>4.97 (1.22)</td>
<td>$t(143.65) = -0.48$, $p = .64$, $d = .06$</td>
</tr>
<tr>
<td>Perceived restoration</td>
<td>6.36 (1.50)</td>
<td>5.52 (1.94)</td>
<td>$t(158.79) = 3.70$, $p &lt; .001$, $d = .48$</td>
</tr>
</tbody>
</table>

As expected, females were found to report significantly higher ratings of perceived danger (hypothesis 17) and fear (hypothesis 18) than males. Although females were found to report a significantly higher perceived likelihood of encountering a social danger (hypothesis 19a) and becoming lost (hypothesis 19c) than males, no significant difference in the perceived likelihood of encountering physical danger was found between males and females (hypothesis 19b). Contrary to hypothesis 20, females were not found to report significantly lower levels of preference than males, however in support of hypothesis 21, females were found to report significantly lower of perceived restoration than males.

3.4 DISCUSSION

This study examined how variations in the physical structure of a simulated natural environment according to Fisher and Nasar’s (1992) typology affected perceptions of danger (both overall and specific), fear, preference and restoration before exploring the relationships between these variables.
The effect of prospect-refuge

Theoretical and empirical evidence would suggest that the use of Fisher and Nasar’s (1992) typology of prospect-refuge could be applied to natural environments to help reduce negative perceptions such as perceived danger and fear which intuition would lead us to believe are detrimental to preference and perceived restoration. Significant expected differences in perceived danger and fear were found between the three prospect-refuge conditions, with lower levels of prospect-refuge associated with significantly higher ratings of perceived danger and fear. This supports work conducted by Herzog and his colleagues within natural environments who have demonstrated that the manipulation of perception and information-based variables can evoke significant differences in perceptions of overall danger and fear in natural environments (e.g. Chapin, 1991; Herzog & Kirk, 2005; Herzog & Kropscott, 2004; Herzog & Kutzli, 2002). Dense forestry and heavy vegetation have also been associated with higher levels of fear and danger (e.g. Talbot & Kaplan, 1993; Schroeder & Anderson, 1984). These results support the application of Fisher and Nasar’s (1992) typology of prospect-refuge to help influence negative perceptions of a natural environment. This is important because, until now, research using the typology has been almost entirely confined to explaining differences in perceived safety in urban settings (e.g. Fisher & Nasar, 1992; Nasar & Jones, 1997; Petherick, 2000/2001; Wang & Taylor, 2006).

Expected differences in preference were also found between the three prospect-refuge conditions, with higher levels of prospect-refuge receiving the greatest preference ratings. This finding ties in well with Fisher and Nasar’s (1992) typology because it is derived from evolutionary accounts of environmental preference. This approach advocates that an environment is preferred because it is perceived as being safer and the results of this chapter clearly support this. The effect of differences in the physical structure of the environment on perceived restoration is something that has been largely ignored by previous research. Expected differences in perceived restoration were also found, with higher levels of prospect-refuge associated with significantly higher levels of perceived restoration. These significant differences were also found when perceived restoration was broken down into the four dimensions measured by the SRSS. Both SRT
and ART theories of restoration emphasise the need for a compatible environment for restoration to occur. A compatible environment is likely to be free from dangers that seize an individual’s voluntary attention and evokes stress because these are the states restoration attempts to overcome. The importance of feeling safe in order for restoration to occur is further highlighted by Staats and Hartig (2004) who, using scenes of everyday nature, found two opposed effects where company enhanced restoration when safety was a concern, whilst solitude enhanced restoration when safety was controlled for. By providing good prospect, low refuge for a potential offender and an unobstructed escape for a potential victim, an environment becomes perceived as being safer from danger and more conducive to survival. Exponents of evolutionary accounts advocate that survival nurtures human physiology and promotes a sense of well-being. It is these types of environments that produce the greatest restorative effects (Ulrich, 1993).

The distinction made between different types of danger appears warranted because the results revealed some interesting findings. Significant expected differences in the perceived likelihood of encountering a physical danger or becoming lost were found between the three conditions, with higher levels of prospect-refuge resulting in a significantly lower perceived likelihood of encountering a physical danger or becoming lost. This finding is particularly useful for the danger of becoming lost because the perceived likelihood of becoming lost was found to have a significant negative effect on preference and perceived restoration. Therefore designing country parks so that they contain high levels of prospect and accessibility but low levels of refuge means that people are less likely to feel that they could become lost and so their preference and perceived restorative value of the environments is not degraded.

However no significant differences in the perceived likelihood ratings of encountering a social danger between the prospect-refuge conditions were found. At face value, this is highly surprising. Fisher and Nasar’s (1992) typology of prospect-refuge is largely based upon the risk of social danger, an individual’s perception of safety from a potential offender within an urban environment. One would therefore understandably expect that of the three specific types of danger investigated by this study, the typology would be most successful in differentiating the perceived likelihood of encountering a social danger. One possible explanation for this finding may be that it
is a result of respondents only being asked for their perceptions of the likelihood of encountering a social danger. Using a measure of social danger similar to that of the overall perceived measure used in this study, i.e. that encompassed elements of perceived severity and control may have yielded significant differences in the perceived likelihood of encountering a social danger between the three prospect-refuge conditions. Levels of prospect, refuge and escape are all likely to influence the perceived severity and control an individual feels they have over a social danger. For example, a low prospect-refuge environment that offers a limited or impeded escape for a potential victim is likely to reduce their perceived control over a social danger because the environment inhibits their behavioural response of trying to flee.

Nonetheless it appears that in the absence of an actual social danger or specific threat of encountering one, the physical structure of the environment makes no significant difference to people’s perceptions of how likely it is they will encounter a social danger within a country park. Not only does this differ from work within urban environments that has shown lower levels of prospect-refuge to be associated with higher perceptions of becoming a victim of social danger (e.g. Nasar & Jones, 1997; Petherick 2000/2001; Wang & Taylor, 2006) but also work within urban parks that has demonstrated high levels of dense understory vegetation, that impedes prospect and offers potential attackers a place to hide, to be associated with a higher fear of crime (e.g. Fisher & Nasar, 1992; Kuo, Bacaicou & Sullivan, 1998; Troy & Gove, 2008). Micheal, Hull and Zahm (1999) claim that vegetation that impedes prospect is likely to facilitate criminal activity and this is likely to result in not just an increased fear of crime, but also an increased perceived likelihood of crime. However country parks tend to be much larger and provide a far more natural rural atmosphere than urban parks. People may therefore expect country parks to contain far less of the criminal and social dangers that urban environments have become associated with. Therefore people may perceive the perceived likelihood of encountering a social danger as being much lower in a country park environment than in an urban park or urban environment. Indeed mean ratings for the likelihood of encountering a social danger fell midway on the scale suggesting that people only perceived a moderate likelihood of a encountering a social danger. Because a country park is not typically associated with social danger, prospect-
refuge may not actually be that important and respondents may have generalised the perceived likelihood of encountering a social danger in terms of a country park regardless of its physical structure. Of course it seems plausible that the physical structure of the environment is more likely to play some part in an individual’s perceptions and emotional reactions if a danger is actually present or threatened. The next step for research to take should therefore be an examination of whether variations in the physical structure of a natural environment can evoke significant differences in perceptions of danger, fear, preference and restoration if the threat of encountering specific dangers is manipulated.

*The relationships between variables*

A clear distinction was made between perceived danger and fear earlier in this study. In support of this, although a strong positive correlation was found between the two constructs, over half the variance remained unshared, supporting the need for the two to be regarded as distinct constructs. The moderate negative relationship found between perceived danger and preference comfortably falls within the range reported by Herzog and colleagues within natural environments (e.g. Herzog & Flynn-Smith, 2001; Herzog & Miller, 1988). However perceived danger was found to be a significantly stronger negative predictor of perceived restoration than it was of preference. Despite intuition telling us that perceived danger damages perceived restoration, to the author’s knowledge, this is the first time the relationship has been explicitly stated. Not only this, but by combining elements of perceived severity and control in addition to the perceived likelihood of coming to harm, it is felt that this study has used a more realistic measure of perceived danger than the majority of existing literature within the environmental psychology field that has focussed primarily on perceptions of the likelihood of encountering danger.

A similar pattern emerged for the relationships fear shared with preference and perceived restoration. Although fear was found to be a strong negative predictor of both preference and perceived restoration, the effect of fear was significantly greater on perceived restoration. Once again these findings confirm intuition and the largely
untested theoretical support that fear would have a negative effect on perceived restoration. One possible explanation for fear appearing to be a stronger negative predictor of perceived restoration than perceived danger is because danger is not always a bad thing, in some cases such as extreme sports, danger can be attractive, particularly if it is not accompanied by fear. For example, regular enthusiasts may acknowledge kayaking to be dangerous, but it may not evoke fear. Instead to them it may offer valuable restbite from the strains and stresses of busy modern life (e.g. Loeffler, 2004). Fear represents an extreme negative response towards a stimulus or event that is typically perceived as threatening survival. This is clearly counter to the restoration process and because fear and stress tend to be highly positively correlated (Brannon & Feist, 1997), fear will almost invariably prevent restoration by increasing rather decreasing stress. The distinction between perceived danger and fear is further supported by the finding that fear was a significantly stronger negative predictor of perceived restoration than perceived danger. Therefore despite their similarities, it appears as though it is the negative emotional reaction of the perception of danger rather the cognitive appraisal of it that damages perceived restoration the most.

Corroborating existing research, a positive relationship between preference and perceived restoration was also found (e.g. Han, in press; Purcell et al., 2001; van den Berg et al., 2003). Taken together, these results show that the preference for and the perceived restorative value of a natural environment such as a country park can be detrimentally affected by perceived danger and in particular fear. It was felt that perceptions of danger may be influenced by trait anxiety and so this was explored. However trait anxiety failed to be a significant predictor of perceived danger, fear, preference or perceived restoration. Blöbaum and Hunecke (2005) also failed to find an effect of trait anxiety on perceptions of danger within an urban environment and concluded that the use of a predominantly young adult sample may have explained this. This study also used a fairly young adult sample and so this explanation may also account for the lack of significant results here. With the future studies in this thesis expected to use a similar demographic sample to aid comparison between studies, the researcher feels that it is not worth continuing to explore the role of anxiety as this may detract from the overall aims of this thesis.
But how is the perceived likelihood of encountering specific dangers related to these constructs? Although the perceived likelihood of encountering all three types of danger were found to be positive predictors of perceived danger, only the perceived likelihood of encountering a social danger or becoming lost were significant (positive) predictors of fear. In both cases, the corresponding Beta values revealed the perceived likelihood of encountering a social danger to be the strongest positive predictor. These results become even more interesting when one considers that once again, only the perceived likelihood of encountering a social danger or becoming lost were significant (negative) predictors of preference and perceived restoration. The Beta values for the perceived likelihood of encountering a social danger and becoming lost were very similar when predicting preference, but in relation to perceived restoration, the perceived likelihood of encountering a social danger was clearly the strongest negative predictor. Very little published research to date has distinguished between types of danger. However of the research that has, and consistent with the results of this study, Herzog and Smith (1988) found social danger but not physical danger was related (negative) to preference.

The results of this study suggest that it is the perceived likelihood of encountering a danger that evokes fear that has a negative impact on preference and to an even greater extent, perceived restoration. Of the three specific dangers investigated, it is the perceived likelihood of encountering a social danger that has the strongest positive effect on perceived danger and most notably fear, and this consequently has the strongest negative effect on perceived restoration. Of the distinction between different types of danger, the effect of social danger on perceived restoration has been explored in a recent study by Herzog and Rector (2009). The presence of an imminent social danger was found to have a highly detrimental effect on the perceived likelihood of restoration, particularly when imagining walking through a natural environment. The results of this chapter clearly support this finding and build on it by using a methodology where a visual representation of the environment was provided.

So why, despite it being perceived as dangerous, was the perceived likelihood of encountering a physical danger not found to have a significant effect on fear, preference or perceived danger? Previous research has demonstrated that when coming into contact
with sources of physical danger in a natural environment, people may experience
positive as well as negative emotions such as fear (e.g. Kaplan & Talbot, 1983; van den
Berg & ter Heijne, 2005). By successfully confronting the physical challenges and
dangers that ‘lurk in the woods’ individuals often report feeling refreshed and
invigorated (Kaplan & Talbot, 1983). It seems plausible that people accept physical
danger such as animals, the weather and physical obstructions as an intrinsic part of
nature. In response to encountering these types of danger and because humans may have
a fundamental and genetically based need and propensity to affiliate with nature
(Wilson, 1984), people may have learnt to anticipate some positive emotions such as the.ones documented by existing research. These positive emotions may dilute negative
emotions such as fear so that the perceived likelihood of encountering a physical danger
is not a significant predictor of fear. As a result of this and because fear appears to be the
dominant negative predictor of preference and perceived restoration over perceived
danger, the perceived likelihood of encountering a physical danger also fails to be a
significant predictor of preference or perceived restoration. However it is also worth
considering that the definition of physical danger used in this study still encompasses a
very broad range of dangers as the manipulation checks reveal. Future research in the
area may like to disseminate physical danger yet further into animate sources of danger
(e.g. animals, snakes etc.) and inanimate sources of danger (e.g. obstacles and physical
features that could lead to personal injury) as there may yet be differences between these
types of danger, particularly in terms of perceived likelihood, severity and control.

Gender differences

The gender differences in perceived danger and fear found in this study also
provide further support for existing studies that have reported a tendency for females to
report higher levels of danger and fear than males in both urban and natural
environments (e.g. Fredrikson et al., 1996; Lee, 1982). Although this study makes no
attempt to examine the processes underlying these differences, the distinction between
different sources of danger does add to the research area. The finding that females
perceived a greater likelihood of social danger than males is consistent with previous
research that has demonstrated that women express more fear and greater perceived danger about being the victim of aggression and crime than men (e.g. Blöbaum & Hunecke, 2005; Ferraro, 1996; Harris & Miller, 2000; Nasar & Jones, 1997). However no significant gender differences were found for likelihood ratings of becoming a victim of physical and lost danger. These results are interesting because they conflict with findings such as Van den Berg and Ter Heijne (2005) who found that women typically express more negative emotions than men in response to threatening encounters with nature. Further research into the area might like to examine whether other important factors in perceived danger such as severity and perceived control of specific types of dangers evoke significant gender differences. However the exploration of these gender differences represents a vast line of new research that could warrant a thesis in itself. For this reason, the remainder of this thesis will explore the effects of different types of danger in natural environments without examining the role of gender.

3.5 THE NEXT STEP FOR THE THESIS

The results of this study suggest that Fisher and Nasar's (1992) typology of prospect-refuge can be applied to a natural environment to explain differences in perceptions of danger, fear, preference and restoration. However in regards to the perceived likelihood of encountering specific dangers, it may not be as successful. The perceived likelihood of encountering a social danger was found to be a particularly fear-evoking type of danger, detrimental to positive perceptions such as preference and restoration. Rather surprisingly, perceptions of the likelihood of encountering a social danger were not found to vary between prospect-refuge environments. Given this and the evidence to support the distinction between different types of danger, the logical direction for this thesis to follow involves manipulating the threat of encountering specific types of danger on walks through a country park that once again differ in levels of prospect-refuge, and explore the effect this has on perceptions of danger, fear, preference and restoration.
CHAPTER 4

THE EFFECT OF DANGER THREATS ON NATURE EXPERIENCES

4.1 INTRODUCTION

The aim of this research study is to build on the results of the previous one by manipulating the threat of encountering specific dangers within a natural environment. The previous study measured the perceived likelihood ratings of encountering specific types of danger. Using a correlational design, it explored the relationships between the perceived likelihood of encountering social, physical and becoming lost dangers with perceived danger, fear, preference and perceived restoration. This study takes these ideas forward, adopting a different design that manipulates the threat of encountering these specific types of danger during a walk through two different versions of a country park environment. In the real world, an environment may become associated with a specific type of danger following a publicised incident. Prior knowledge of an incident may result in an increased perceived threat of a similar incident occurring. The effect of specific danger threats within a natural environment on negative perceptions such as danger and fear, together with positive perceptions such as preference and perceived restoration, is largely unknown. Understanding the effects of specific danger threats and their potential interactions with environmental design may yield important theoretical and practical implications to help maintain the physiological and psychological benefits typically provided as a result of contact with natural environments such as country parks.

Summary of relevant research

The results of the previous study highlighted the negative effects that both perceived danger and to a greater extent fear, have on preference and perceived
restoration within a simulated walk through a country park. Fear evoking dangers were found to be most detrimental to preference and perceived restoration. Moreover the perceived likelihood of encountering social danger, which was the most fear evoking type of danger studied, had the greatest negative impact on preference and perceived restoration. The perceived likelihood of getting lost also had a significant negative effect on preference and perceived restoration. However the perceived likelihood of encountering a physical danger had no significant effect on either preference or perceived restoration. This may have been a result of the perceived likelihood of encountering a physical danger failing to be a significant predictor of fear. These findings are consistent with those of Herzog and Smith (1988) who found that the perceived likelihood of encountering a physical danger did not have a significant negative effect on preference. However the definition of physical danger used by Herzog and Smith (1988) was very broad. It encompasses any danger stemming from the physical structure of the environment including animals, weather and tripping over obstacles. It is possible that because the measure used was so broad, it may have been insensitive to finding significant relationships with both fear and perceived restoration for some instances of physical danger. Therefore a clearer distinction between types of physical danger needs to be made. This study makes the distinction between a physical danger stemming from being attacked by an animal and a physical danger stemming from injuring oneself by tripping or falling over obstacles. These two types of physical danger were chosen because both were frequently cited in the free-recall question from the previous study as examples of potentially encounterable dangers within a country park.

The previous study also reported a very interesting finding in regards to the perceived likelihood of encountering a social danger. Despite expected differences between prospect-refuge simulations for both the perceived likelihood of encountering a physical danger or getting lost, all three simulated walks were perceived as having an equal likelihood of encountering a social danger. One possible explanation for this finding was the absence of any active manipulation or priming of danger. Because the perceived likelihood of encountering a social danger was fairly low, it was felt that respondents may have generalised the likelihood of encountering a social danger within
a country park, irrespective of its physical design. It was felt the impact of the physical structure of the environment would play a more prominent role in people's perceptions of that environment if they were aware of a specific danger threat. By manipulating a specific type of danger threat whilst continuing to also manipulate prospect-refuge, this explanation can be tested.

Methodological issues

One methodological issue arising from the previous chapter was that although respondents were asked to complete the questionnaire at the end of a fatiguing day when they would be in a negative emotional state conducive to restoration, we do not actually know whether they were fatigued or not. This study employed a manipulation check to test whether and be able to control for respondents in all conditions were in an equally negative emotional state. Initially developed by McNair, Lorr and Droppleman (1971), the Profile of Mood States (POMS) is a self-report scale that uses likert-scale items to measure emotional distress. The scale measures emotional distress across the six dimensions of fatigue-inertia, vigor-activity, tension-anxiety, depression-dejection, anger-hostility, and confusion-bewilderment. Although the widespread use of the POMS within psychology demonstrates it to be a valid and reliable measure, it was felt that the 65 items would take too much time to complete and were rather extensive for a manipulation check. Shacham (1983) devised a shortened version of the POMS known as the POMS-SF that uses 37 items selected from the original scale and maintains the six dimensions. The high positive correlations between the subscale and the total scores in the POMS and POMS-SF indicate that the POMS-SF is a reliable alternative to the POMS (Curran, Andrykowski & Studts, 1995). The POMS-SF was therefore chosen for use in this study.

The effect of danger threat

In the real world, natural environments such as country parks may become associated with specific dangers. For example, fearful perceptions of nature may be
derived from messages from parents, peers and various media such as horror movies and news reports (Bixler & Floyd, 1997) while perceptions of social danger may be made using information circulated by the media and the subsequent public discourse surrounding it. Reading crime-related tabloid front pages has been shown to be positively associated with both avoidance behaviour and higher levels of perceived danger of becoming a victim of crime (Smolej & Kivivuori, 2006). Dangerous encounters within natural environments that are reported and discussed in the media may then have a detrimental effect on the quality and quantity of visits to the environment. Given the importance of natural environments such as country parks in providing psychological and physiological health benefits, it is imperative that we attempt to understand how the perception of potentially encountering a specific danger affects perceptions within the environment so that effective counter-strategies can be developed.

Manipulating the threat of specific dangers that one may encounter within a walk through a natural environment is something that does not appear to have been explored by existing research. In this study, five threat message manipulations were developed: control, social, physical (animal), physical (tripping) and becoming lost. To standardise the perceived consequences of a potential encounter with each of the dangers, the four specific danger manipulations all described an incident where the victim required medical assistance. There is evidence from existing studies (e.g. Herzog & Smith, 1988; Kaplan & Talbot, 1983; van den Berg & ter Heijne, 2005) and the results of the previous study to suggest that different types of danger may have significantly different impacts on perceived danger, fear, preference and perceived restoration.

The results of the previous study suggest that the perceived likelihood of encountering a social danger and becoming lost are specific types of danger are likely to have the biggest detrimental effect on perceived restoration and preference. It was posited that this was because in addition to being perceived as dangerous, these dangers also had a significant positive effect on fear. The perceived likelihood of encountering a physical danger did not have a significant effect on fear and consequently, did not have a significant effect on perceived restoration or preference. It seems reasonable to expect similar findings with the manipulation of danger threat because it seems likely that the perceived likelihood of encountering a specific danger will remain an important element
when people appraise the effect of the threat. Therefore it is anticipated that the social and lost danger threats will result in the highest levels of perceived danger and fear and consequently, the lowest levels of perceived restoration and preference being expressed. This study has also broken physical danger into two types - physical danger from an animate source (animal) and physical danger from an inanimate source (injury from tripping over obstacles). Although it is unclear whether significant differences in perceived restoration, preference, fear or perceived danger will be found between the two types, it is also unclear as to whether these perceptions will be significantly different to the control condition. Because there will be a manipulation of danger threat, it seems likely that both physical danger knowledge conditions will be perceived as more dangerous than the control condition. However the previous study did not find the perceived likelihood of encountering a physical danger to have a significant effect on fear. In response to incidents of physical danger, some research has documented people expressing positive emotions in addition to negative ones such as fear (e.g. Kaplan & Talbot, 1983; van den Berg & ter Heijne, 2005). If it really is fear that impacts on perceived restoration and preference the most, as the results of the previous chapter suggest, then one could speculate that the two physical danger threats will not be perceived as significantly more fear-evoking and consequently, not perceived as less restorative or less preferred than the control condition. However being attacked by an animal and the threat of injury from tripping over obstacles in a natural environment are examples of real dangers that people may be scared of (e.g. Bixler & Floyd, 1997; Coble et al., 2003). It therefore still seems reasonable to expect that both physical danger threats will result in significantly less favourable perceptions than the control condition (higher perceived danger and fear but lower preference and perceived restoration) albeit not as severe as the social and lost danger threats. Overall, it is expected that respondents who receive a danger threat manipulation will perceive the environment as more dangerous (hypothesis 1) and fearful (hypothesis 2) but less preferred (hypothesis 3) and restorative (hypothesis 4) than respondents given a control condition.

The measure of perceived danger in this study will use the same 3 items measuring perceived likelihood, severity and control as in the previous chapter. It is highly probable that different dangers are made up of different perceptions. For
example, one is likely to perceive a greater likelihood of tripping over an obstacle than being attacked by another person, but the potential severity of the two dangers differs enormously. Therefore it also seems a prudent idea to explore the perceived danger ‘make-up’ of the danger threat manipulations used in this study. This may help improve our understanding of the effects of different danger threats.

The effect of prospect-refuge

Fisher and Nasar’s (1992) typology of prospect-refuge was once again used as a way of manipulating the physical structure of the environment. Based on Appleton’s (1975) prospect-refuge theory, the typology attempts to explain an individual’s perceptions of an environment based on the levels of prospect, refuge and accessibility. Urban environments that are low in prospect, contain a high level of refuge for a potential offender to hide and offer an impeded escape for a potential victim are perceived as less safe/more dangerous, evoke a higher fear of crime and are less preferred than environments high in prospect, that contain a low level of refuge for a potential offender and offer a quick escape for a potential victim (e.g. Fisher & Nasar, 1992; Nasar & Jones, 1997; Petherick, 2000/2001; Wang & Taylor, 2006). The previous study successfully applied the typology to a country park environment, with lower levels of prospect-refuge being found to evoke more fear and be perceived as more dangerous than higher levels of prospect-refuge. Because of the negative effects of perceived danger and fear on preference and perceived restoration, lower levels of prospect-refuge were also found to be less preferred and perceived as less restorative than higher levels of prospect-refuge. These results suggest that the typology is a good way of manipulating the physical structure of a natural environment and that a low prospect-refuge environment will once again receive significantly higher ratings of perceived danger (hypothesis 5) and fear (hypothesis 6) but significantly lower ratings of preference (hypothesis 7) and perceived restoration (hypothesis 8) than a high prospect-refuge environment.

However the previous study found the typology to be less successful in response to the perceived likelihood of encountering specific types of danger. Although higher
levels of prospect-refuge were associated with a reduced perceived likelihood of encountering either a physical danger or becoming lost, no significant differences were found between prospect-refuge conditions for the perceived likelihood of encountering a social danger. The design of this study allows any interaction between prospect-refuge and type of danger to be explored because both are manipulated. Given that this is very much an unexplored area by existing research, it seems a prudent idea to test for interaction effects on the four dependent variables under investigation.

4.2 METHOD

Respondents and design

Three hundred respondents consisting of undergraduate, postgraduate and alumni members from the University of Surrey’s Human Sciences department were recruited using a snowball sampling technique on the University’s social networking website (179 female; $M = 23.44$ years, $SD = 7.34$ years; 18-56 years). All respondents were United Kingdom residents and although no accurate response rate can be made, the sample was collected within 5 weeks of the initial call for respondents. No respondent had participated in the study reported in the previous study. A $5 \times 2$ between respondent-design was created with five specific danger threat conditions being crossed with two versions of a simulated walk through a country park environment. This created a total of ten conditions with each condition containing thirty respondents. Respondents were randomly assigned to one of the conditions and no compensation was given for participating in the study.

Danger threat manipulations

The danger threats were manipulated by showing respondents a photograph of a mocked-up information board at the start of the simulated walk. It was hoped that by using a realistic looking information board, the manipulation of danger threat would be
more successful and ecologically valid than by just asking respondents to imagine the danger.

The control condition was represented by information telling participants that the park café was closed for refurbishment (*Fig. 4.1*) whilst the social danger threat used a mocked up police appeal describing an assault that had recently occurred within the park (*Fig. 4.2*). Two physical danger threats were developed with one board reporting that wild boar were present in the park and had attacked walkers when disturbed (*Fig. 4.3*), whilst the second physical danger board made reference to recent injuries that had arisen from uneven and unstable paths (*Fig. 4.4*). The lost danger condition was represented by a poster telling respondents that all route markers in the park had been removed for renovation and so walkers needed to have a map or be very familiar with the routes within the park as previous walkers had needed rescuing (*Fig. 4.5*).
Fig. 4.1. Information board for the control condition
POLICE WARNING

SERIOUS ASSAULT

Police are appealing for witnesses after an unprovoked violent assault in this park on the 22nd May 2008.

Owing to the seriousness of the assault, police are advising walkers to be vigilant and avoid walking through the area alone.

The attacker is described as a young male in his early 30s or late 20s, short black hair, around 6ft and wearing a black top. Police are appealing for anyone with information to phone Crimestoppers on 0800 555 111.

Fig. 4.2. Information board for the social danger threat
Fig. 4.3. Information board for the physical danger (animal attack) threat.
Recent rainfall has made rocks and pathways very slippery and uneven. Areas have also been eroded and may be liable to landslides.

Several walkers have been injured tripping or slipping whilst walking through the area so please take care on slippery paths and by trying to avoid walking through or on:

DENSE UNDERGROWTH

STEEP SLOPES

WET ROCKS

May 2006

Fig. 4.4. Information board for the physical danger (injury from accident) threat.
**Environmental simulations**

The same low and high prospect-refuge simulated walks used in the previous study were selected for use in this study along with their corresponding descriptions (see Appendix A). A series of manipulation checks in the previous chapter revealed significant and expected differences in prospect, accessibility and hiding places consistent with Fisher and Nasar’s (1992) typology of prospect-refuge and so it was felt that this was not needed to be done for a second time. Results from the previous study had also revealed that the simulations were perceived as fairly realistic and accurate examples of walks through a country park environment within the United Kingdom.
The twelve photographs depicting a walk through the low prospect-refuge environment contained low levels of foreground prospect, low levels of accessibility characterized by small obstructions on indistinct paths and a high number of potential hiding places. The high prospect-refuge simulated walk was depicted by twelve photographs containing high levels of foreground prospect, high levels of accessibility characterized by unobstructed and established paths and a low number of potential hiding places. Once again, in addition to the photographs, each condition also included the same short descriptions of the walk used in the previous study to help emphasise the physical structure of the environment.

**Measures**

*Perceived danger* was measured using the same three items from the previous study: “How likely do you think it is that you could come to harm during your walk through this environment? How severe are the dangers you could potentially face walking through this environment? How well do you think you could control any potential dangers in this environment?” Because of the wording of the item, ratings of perceived control were then reversed. The response options ranged from 1 (*not at all*) to 7 (*very much so*) and permitted a scale score (mean response) that ranged from 1 (*perceived as not at all dangerous*) to 7 (*perceived as very dangerous*). The scale was once again found to have a respectable level of internal consistency (Cronbach’s $\alpha = .73$) with an inter-item correlation of .47.

*Fear* was also measured using the same 3 items from the previous study: “How frightened would you be taking a walk through this environment? How scared would you be taking a walk through this environment? How uneasy would you be taking a walk through this environment?” The response options ranged from 1 (*not at all*) to 7 (*very much so*) that permitted a scale score (mean response) that ranged from 1 (*perceived as not at all fear evoking*) to 7 (*perceived as very fear evoking*). The scale had high internal consistency (Cronbach’s $\alpha = .97$) with an inter-item correlation of .93.

*Preference* was measured using 4 items that encompassed both beauty ratings and preference relative to other environments: “How pretty do you find this
environment? To what extent do you like this environment? To what extent do you like this environment more than other natural environments you have visited? How beautiful do you find this environment?" The response options ranged from 1 (not at all) to 7 (very much so) and permitted a scale score (mean response) that ranged from 1 (not at all preferred) to 7 (very highly preferred). The scale had a high level of internal consistency (Cronbach’s α = .89) with an inter-item correlation of .66.

Perceived restoration was once again measured using Han’s (2003) self-rating restoration scale (SRRS), consisting of eight items spread evenly across four dimensions of perceived restoration (emotional, physiological, cognitive and behavioral). The overall scale was once again found to have very high internal consistency (Cronbach’s α = .84) with a very respectable mean correlation between items of .40. Each of the four dimensions were also found to have a more than satisfactory level of internal consistency and inter-item correlations were not strong enough to suggest multicollinearity (Emotional, Cronbach’s α = .88, Inter-item correlation = .80; Physiological, Cronbach’s α = .83, Inter-item correlation = .71; Cognitive, Cronbach’s α = .72, Inter-item correlation = .56; Behavioral, Cronbach’s α = .89, Inter-item correlation = .81).

The detailed initial model of the SRRS hypothesizes 4 dimensions and confirmatory factor analysis using SAS program using the data from all three conditions indicated a good fit between the hypothesized model and the collected data (see Table 4.1).

Table 4.1.

<table>
<thead>
<tr>
<th>Model fit criteria of the SRRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>χ² (favourable value &lt;3.0)</td>
</tr>
<tr>
<td>-----------------------------</td>
</tr>
<tr>
<td>1.17</td>
</tr>
</tbody>
</table>

Multicollinearity did not appear to be a problem as none of the six pairs of relations between each of the dimensions were found to be greater than 0.85. Values less than this can be considered as showing an acceptable level of discriminant validity.
(Kline, 1998). A good level of convergent validity was also demonstrated with high loadings (all $R^2 > .50$) of each set of variables on their common underlying factor.

Profile of Mood States (POMS-SF). To check that respondents were in an emotional and attentional state conducive to restoration and that no significant differences between the conditions were present, the POMS-SF (Shacham, 1983) was completed by each respondent at the start of the study. The POMS-SF is a 36-item measure of emotion spread across the 6 dimensions of depression, confusion, tension, anger, fatigue and vigour. Respondents are asked to score each item in agreement to how they are currently feeling from 1 (not at all) to 5 (very much so). Total mood disturbance score was calculated by adding the mean scores for the first five dimensions together before subtracting the mean vigour dimension score permitting a minimum score of 0 and a maximum score of 24.

Perceived likelihood of encountering social danger, physical danger and becoming lost were measured to ensure the danger knowledge manipulations successfully primed the specific type of danger intended. Social danger was measured using the items: “How likely do you think it is that you could be attacked by another person in this environment?” Physical danger was measured using the item: “How likely do you think it is that you could come to harm from nature or the physical structure of the environment?” Becoming lost was measured using the item: “How likely do you think it is that you could lose your way and become lost walking through this environment?” The response options for all three dangers ranged from 1 (not at all) to 5 (very much so).

Procedure

An online questionnaire was created for the study. Respondents were e-mailed the weblink and asked to complete it at the end of a fatiguing working day in a quiet environment without any distractions. Following a brief outline of the study and consent given, respondents completed the 36 item POMS-SF before being randomly assigned to one of the ten conditions. Respondents were first given instructions telling them to
imagine that they felt fatigued and had decided to take a walk through a local country park. They were then told that they would see a slideshow of photographs from that walk but the first photo they would see was from an information board at the start of the walk. By clicking continue, respondents saw the mocked-up information board and after clicking continue for a second time, the respondent was presented with the walk description. After clicking continue for a third time, the simulated walk began with each of the 12 photographs of the walk being presented in turn for 3 seconds before fading out and merging into the next one. At the end of the slideshow, respondents were given the perceived restoration and preference measures to complete. Upon completion of the measures, the information board, description of the walk and the slideshow was presented for a second time before respondents were asked to complete the fear and perceived danger measures. Respondents saw everything twice to ensure that the information board, walk and description remained salient. To prevent order effects, the order in which respondents completed the measures were randomised. Half the respondents were given the perceived restoration and preference measures to complete before the perceived danger and fear measures whilst the other half completed the perceived danger and fear measures before the perceived restoration and preference measures. Respondents were then asked to complete the specific danger likelihood measures, record their age and gender before being given the opportunity to make any further comments they may have had about the study.

4.3 RESULTS

Manipulation checks

No significant differences in age ($\chi^2 (9) = 8.06, p = .53$) or gender ($\chi^2 (9) = 1.66, p = .99$) were found between the ten conditions. Scores on the POMS-SF ranged from 13.33 to 23.53 and indicated a fairly high level of mood disturbance ($M = 19.87, SD = 3.45$). A Kruskal-Wallis test revealed that there were no significant differences in mood disturbance between the ten conditions ($\chi^2 (9) = 5.28, p = .81$).
To test whether the manipulation of danger threat was successful and only increased perceived threat of the intended specific type of danger, a series of manipulation checks were conducted. Significant differences in the perceived likelihood of encountering a social danger were found between the 5 different danger threat conditions ($F (4, 145.21) = 2.44, p<.05$) (Welch correction). Respondents given the social danger threat reported a significantly higher perceived chance of encountering a social danger than all the other danger threat conditions (see Table 4.2).

**Table 4.2.**

*Perceived likelihood ratings (standard deviation) of encountering a social danger between the five danger threats*

<table>
<thead>
<tr>
<th>Danger threat</th>
<th>Social danger rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social</td>
<td>3.77 (1.14)</td>
</tr>
<tr>
<td>Control</td>
<td>3.07 (1.33)</td>
</tr>
<tr>
<td>Physical (Animal)</td>
<td>3.00 (1.35)</td>
</tr>
<tr>
<td>Physical (Tripping)</td>
<td>2.97 (1.17)</td>
</tr>
<tr>
<td>Lost</td>
<td>3.17 (1.27)</td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly ($p>.05$).

Although no significant overall differences in the perceived likelihood of encountering a physical danger was found, $F (4, 145.04) = 1.79, p = .13$ (Welch correction), it was likely that this was due to having two physical danger threats. When the two physical danger threats (animal and tripping) were compared to the other conditions, expected significant differences were found. As can be seen in Table 4.3, ratings of encountering a physical danger were significantly higher for those given either physical danger threats than for the remaining 3 conditions.
Table 4.3.
Perceived likelihood ratings (standard deviation) of encountering a physical danger between the five danger threats

<table>
<thead>
<tr>
<th>Danger threat</th>
<th>Physical danger rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical (Animal)</td>
<td>3.50 (1.60) (^a)</td>
</tr>
<tr>
<td>Physical (Tripping)</td>
<td>3.38 (1.75) (^a)</td>
</tr>
<tr>
<td>Control</td>
<td>2.81 (1.40) (^b)</td>
</tr>
<tr>
<td>Lost</td>
<td>2.98 (1.42) (^b)</td>
</tr>
<tr>
<td>Social</td>
<td>2.83 (1.86) (^b)</td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly (\(p>.05\)).

Significant differences in the perceived likelihood of becoming lost were found between the 5 different danger threat conditions (\(F (4, 295) = 3.35, p<.03\)). Respondents given the lost danger threat reported a significantly higher perceived likelihood of becoming lost than those given either the physical or social danger threats (see Table 4.4). Although those given the lost danger threat reported a higher likelihood rating of becoming lost than the control condition, the difference was not found to be significant.

Table 4.4.
Perceived likelihood ratings (standard deviation) of becoming lost between the five danger threats

<table>
<thead>
<tr>
<th>Danger threat</th>
<th>Lost danger rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lost</td>
<td>3.48 (1.49) (^a)</td>
</tr>
<tr>
<td>Control</td>
<td>3.29 (1.59) (^a)</td>
</tr>
<tr>
<td>Physical (Animal)</td>
<td>3.10 (1.64) (^b)</td>
</tr>
<tr>
<td>Physical (Tripping)</td>
<td>3.05 (1.72) (^b)</td>
</tr>
<tr>
<td>Social</td>
<td>3.11 (1.82) (^b)</td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly (\(p>.05\)).

Differences between danger threats

Four two-way between-subjects ANOVAs were conducted with danger threat condition and prospect-refuge as the two independent factors with perceived danger,
fear, preference and perceived restoration as the dependent factors. As can be seen in Table 4.5, significant main effects of danger threat were found for perceived danger (*hypothesis 1*), fear (*hypothesis 2*), preference (*hypothesis 3*) and perceived restoration (*hypothesis 4*).

Table 4.5.

*Main effect results of danger threat for each of the variables under investigation*

<table>
<thead>
<tr>
<th>Variable</th>
<th>ANOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived danger</td>
<td>$F(4, 288) = 6.99, p &lt; .001, \eta^2 = .10$</td>
</tr>
<tr>
<td>Fear</td>
<td>$F(4, 288) = 10.04, p &lt; .001, \eta^2 = .12$</td>
</tr>
<tr>
<td>Preference</td>
<td>$F(4, 288) = 6.72, p &lt; .001, \eta^2 = .09$</td>
</tr>
<tr>
<td>Perceived restoration</td>
<td>$F(4, 288) = 10.95, p &lt; .001, \eta^2 = .13$</td>
</tr>
</tbody>
</table>

A series of Tukey HSD post-hocs were conducted to examine the differences between each of the five danger threats (see Table 4.6). In terms of perceived danger, all danger threats with the exception of the lost danger threat were perceived as significantly more dangerous than the control condition. However the social danger threat was perceived as significantly more dangerous than all the other danger threats. The social danger threat was also rated as significantly more fearful than all the other danger threats. No significant differences in fear were found between any of the other danger threats.

In terms of preference, only the social danger threat was significantly less preferred than the control condition. It also received significantly lower preference ratings than both the physical (tripping) and lost danger threats. The social danger threat was also perceived as significantly less restorative than all other danger threats. Although no significant differences in ratings of perceived restoration were found between the two physical and lost danger threats, only the physical (tripping) danger threat was found to have received significantly lower perceived restoration ratings than the control condition.
Table 4.6.

Mean ratings (standard deviation) for each of the five danger threats with Tukey HSD post-hoc results

<table>
<thead>
<tr>
<th>Danger threat</th>
<th>Perceived danger</th>
<th>Fear</th>
<th>Preference</th>
<th>Perceived restoration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>3.26&lt;sub&gt;a&lt;/sub&gt;</td>
<td>3.34&lt;sub&gt;a&lt;/sub&gt;</td>
<td>3.81&lt;sub&gt;a&lt;/sub&gt;</td>
<td>6.11&lt;sub&gt;a&lt;/sub&gt;</td>
</tr>
<tr>
<td></td>
<td>(0.75)</td>
<td>(2.23)</td>
<td>(1.34)</td>
<td>(1.28)</td>
</tr>
<tr>
<td>Physical</td>
<td>3.71&lt;sub&gt;b&lt;/sub&gt;</td>
<td>3.79&lt;sub&gt;a&lt;/sub&gt;</td>
<td>3.29&lt;sub&gt;a b&lt;/sub&gt;</td>
<td>5.59&lt;sub&gt;a b&lt;/sub&gt;</td>
</tr>
<tr>
<td>(Animal)</td>
<td>(1.30)</td>
<td>(2.45)</td>
<td>(1.53)</td>
<td>(1.26)</td>
</tr>
<tr>
<td>Physical</td>
<td>3.57&lt;sub&gt;b&lt;/sub&gt;</td>
<td>3.31&lt;sub&gt;a&lt;/sub&gt;</td>
<td>3.67&lt;sub&gt;a&lt;/sub&gt;</td>
<td>5.44&lt;sub&gt;b&lt;/sub&gt;</td>
</tr>
<tr>
<td>(Tripping)</td>
<td>(1.28)</td>
<td>(2.20)</td>
<td>(1.65)</td>
<td>(1.54)</td>
</tr>
<tr>
<td>Lost</td>
<td>3.32&lt;sub&gt;a b&lt;/sub&gt;</td>
<td>3.53&lt;sub&gt;a&lt;/sub&gt;</td>
<td>3.82&lt;sub&gt;a&lt;/sub&gt;</td>
<td>5.97&lt;sub&gt;a b&lt;/sub&gt;</td>
</tr>
<tr>
<td></td>
<td>(1.38)</td>
<td>(2.13)</td>
<td>(1.60)</td>
<td>(1.72)</td>
</tr>
<tr>
<td>Social</td>
<td>4.22&lt;sub&gt;c&lt;/sub&gt;</td>
<td>5.24&lt;sub&gt;b&lt;/sub&gt;</td>
<td>2.75&lt;sub&gt;b&lt;/sub&gt;</td>
<td>4.70&lt;sub&gt;c&lt;/sub&gt;</td>
</tr>
<tr>
<td></td>
<td>(0.95)</td>
<td>(2.66)</td>
<td>(1.54)</td>
<td>(1.38)</td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly (p>.05).

The measure of perceived danger used in this chapter consists of 3 items (perceived likelihood, severity and control of danger). By also examining the item responses, it was felt that a deeper understanding of the underlying factors of specific type of dangers could be gained. Analyses using one-way between subjects ANOVAs revealed significant differences between the five danger threats for perceived likelihood \(F(4, 291) = 6.02, p<.001, \eta^2 = .08\), severity \(F(4, 144.05) = 19.41, p<.001, \eta^2 = .16\) but not perceived control of danger \(F(4, 214.41) = 2.19, p = .07, \eta^2 = .02\). Table 4.7 displays the mean ratings with the Tukey HSD post-hocs that were conducted to examine the differences between each of the five danger threats.

In terms of the perceived likelihood of encountering the danger on the information board, the social danger threat received significantly higher likelihood ratings than all the other danger threats. No other differences were significant. The social danger threat also received significantly higher ratings of perceived severity than any of the other danger threats. However both physical danger threats were perceived to contain a more severe danger than the lost danger threat. The only significant difference in perceived control was that the physical (animal) danger threat received significantly higher ratings of perceived control than the lost danger threat.
Table 4.7.

Mean perceived danger item ratings (standard deviation) for the four manipulated danger threats with Tukey HSD post-hoc results

<table>
<thead>
<tr>
<th>Danger threat condition</th>
<th>Perceived likelihood</th>
<th>Perceived severity</th>
<th>Perceived control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical</td>
<td>2.90&lt;sub&gt;a&lt;/sub&gt;</td>
<td>3.40&lt;sub&gt;b&lt;/sub&gt;</td>
<td>4.83&lt;sub&gt;b&lt;/sub&gt;</td>
</tr>
<tr>
<td>(Animal)</td>
<td>(1.43)</td>
<td>(1.62)</td>
<td>(1.18)</td>
</tr>
<tr>
<td>Physical</td>
<td>3.03&lt;sub&gt;a&lt;/sub&gt;</td>
<td>3.34&lt;sub&gt;b&lt;/sub&gt;</td>
<td>4.34&lt;sub&gt;a,b&lt;/sub&gt;</td>
</tr>
<tr>
<td>(Tripping)</td>
<td>(1.51)</td>
<td>(1.60)</td>
<td>(1.62)</td>
</tr>
<tr>
<td>Lost</td>
<td>2.86&lt;sub&gt;a&lt;/sub&gt;</td>
<td>3.03&lt;sub&gt;a&lt;/sub&gt;</td>
<td>4.07&lt;sub&gt;a&lt;/sub&gt;</td>
</tr>
<tr>
<td></td>
<td>(1.47)</td>
<td>(1.58)</td>
<td>(1.74)</td>
</tr>
<tr>
<td>Social</td>
<td>3.77&lt;sub&gt;b&lt;/sub&gt;</td>
<td>4.38&lt;sub&gt;c&lt;/sub&gt;</td>
<td>4.50&lt;sub&gt;a,b&lt;/sub&gt;</td>
</tr>
<tr>
<td></td>
<td>(1.27)</td>
<td>(1.30)</td>
<td>(1.49)</td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly (p>.05).

The SRRS measure of perceived restoration consists of four dimensions and once again, it was felt that exploring whether the danger threats had a greater effect on one dimension of perceived restoration than another could improve our understanding of the area. Analyses using one-way between subjects ANOVAs revealed significant differences between the five danger threats for all four dimensions of perceived restoration (see Table 4.8). Significant Levene’s test results for the emotional, cognitive and physiological dimensions meant that the Welch correction was adopted.

Table 4.8.

Main effect results of danger threat for the four dimensions of perceived restoration

<table>
<thead>
<tr>
<th>Dimension</th>
<th>ANOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotional</td>
<td>$F(4, 144.23) = 9.41, p&lt;.001, \eta^2 = .11$</td>
</tr>
<tr>
<td>Cognitive</td>
<td>$F(4, 144.63) = 10.04, p&lt;.001, \eta^2 = .03$</td>
</tr>
<tr>
<td>Physiological</td>
<td>$F(4, 144.66) = 6.72, p&lt;.001, \eta^2 = .07$</td>
</tr>
<tr>
<td>Behavioural</td>
<td>$F(4, 291) = 7.16, p&lt;.001, \eta^2 = .09$</td>
</tr>
</tbody>
</table>

As can be seen in Table 4.9, the social danger threat received significantly lower ratings of perceived emotional, cognitive, physiological and behavioural restoration than all the other danger threats. The only exception is that the physical (tripping) danger
threat was also perceived as less physiologically restorative than the control, physical (animal) and lost danger threats.

Table 4.9.

Mean perceived restoration dimension ratings (standard deviation) for each of the five danger threats with Tukey HSD post-hoc results

<table>
<thead>
<tr>
<th>Danger threat</th>
<th>Emotional</th>
<th>Cognitive</th>
<th>Physiological</th>
<th>Behavioural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>6.10 \text{a}</td>
<td>6.55 \text{a}</td>
<td>6.91 \text{a}</td>
<td>4.90 \text{a}</td>
</tr>
<tr>
<td></td>
<td>(1.59)</td>
<td>(1.38)</td>
<td>(1.64)</td>
<td>(1.73)</td>
</tr>
<tr>
<td>Physical</td>
<td>5.62 \text{a}</td>
<td>5.93 \text{a}</td>
<td>6.58 \text{a}</td>
<td>4.29 \text{a}</td>
</tr>
<tr>
<td>(Animal)</td>
<td>(1.74)</td>
<td>(1.85)</td>
<td>(1.94)</td>
<td>(1.97)</td>
</tr>
<tr>
<td>Physical</td>
<td>5.45 \text{a}</td>
<td>5.97 \text{a}</td>
<td>5.69 \text{b}</td>
<td>4.72 \text{a}</td>
</tr>
<tr>
<td>(Tripping)</td>
<td>(2.14)</td>
<td>(1.54)</td>
<td>(2.28)</td>
<td>(2.13)</td>
</tr>
<tr>
<td>Lost</td>
<td>6.07 \text{a}</td>
<td>6.24 \text{a}</td>
<td>6.64 \text{a}</td>
<td>4.91 \text{a}</td>
</tr>
<tr>
<td></td>
<td>(1.92)</td>
<td>(1.98)</td>
<td>(2.09)</td>
<td>(2.06)</td>
</tr>
<tr>
<td>Social</td>
<td>4.30 \text{b}</td>
<td>5.73 \text{b}</td>
<td>5.48 \text{b}</td>
<td>3.27 \text{b}</td>
</tr>
<tr>
<td></td>
<td>(1.88)</td>
<td>(1.88)</td>
<td>(2.15)</td>
<td>(2.11)</td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly ($p > .05$).

Effect of prospect-refuge

As can be seen in Table 4.10, a number of significant main effects of prospect-refuge were found using a series of one-way between subjects ANOVAs for the dependent factors under investigation. As expected, the low prospect-refuge conditions received significantly higher ratings of perceived danger (hypothesis 5) and fear (hypothesis 6) than the high prospect-refuge conditions. The low prospect-refuge conditions also received significantly lower ratings of preference (hypothesis 7) and perceived restoration (hypothesis 8) than the high prospect-refuge conditions.
Table 4.10.

*Main effect results of prospect-refuge condition for each of the variables under investigation*

<table>
<thead>
<tr>
<th></th>
<th>Low Prospect-Refuge</th>
<th>High Prospect-Refuge</th>
<th>ANOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived danger</td>
<td>4.76 (1.16)</td>
<td>4.13 (1.19)</td>
<td>$F(1, 288) = 20.53, p &lt; .001, \eta^2 = .08$</td>
</tr>
<tr>
<td>Fear</td>
<td>5.02 (2.38)</td>
<td>2.65 (1.83)</td>
<td>$F(1, 288) = 106.14, p &lt; .001, \eta^2 = .27$</td>
</tr>
<tr>
<td>Preference</td>
<td>2.89 (1.43)</td>
<td>4.06 (1.52)</td>
<td>$F(1, 288) = 54.18, p &lt; .001, \eta^2 = .16$</td>
</tr>
<tr>
<td>Perceived restoration</td>
<td>5.11 (1.36)</td>
<td>6.02 (1.29)</td>
<td>$F(1, 288) = 37.21, p &lt; .001, \eta^2 = .12$</td>
</tr>
</tbody>
</table>

*Interaction effects*

Because two factors were manipulated (danger threat and prospect-refuge), there was an opportunity for potential interaction effects that deserve to be examined. These were examined using a series of two-way between-subjects ANOVAs, with danger threat and prospect-refuge acting as the two independent factors. Only a marginally significant interaction between danger threat condition and prospect-refuge was found for perceived danger ratings ($F(4, 288) = 2.30, p = .06, \eta^2 = .04$). However upon further examination, with the exception of the lost and social danger threats, perceived danger ratings in all the other threat conditions were significantly higher in the low prospect-refuge condition than the high prospect-refuge condition (see Table 4.11). Further analysis of the individual perceived danger items in both the lost and social danger threats revealed no significant differences between prospect-refuge conditions for either perceived likelihood or severity ($p$'s > .05). However significant differences were found for perceived control ratings, with the low prospect-refuge environment receiving significant lower ratings than the high prospect-refuge condition in both the lost and social danger threats ($p < .05$).
Table 4.11.

*Mean perceived danger rating (standard deviation) comparisons between danger threats for both prospect-refuge conditions*

<table>
<thead>
<tr>
<th>Danger threat</th>
<th>Low Prospect-Refuge</th>
<th>High Prospect-Refuge</th>
<th>Test of difference between prospect-refuge condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$M$</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>4.22 $\text{a}$</td>
<td>(0.87)</td>
<td>3.70 $\text{a}$</td>
</tr>
<tr>
<td>Physical (Animal)</td>
<td>5.24 $\text{b}$</td>
<td>(0.98)</td>
<td>3.97 $\text{a}$</td>
</tr>
<tr>
<td>Physical (Tripping)</td>
<td>4.92 $\text{ab}$</td>
<td>(1.07)</td>
<td>3.97 $\text{a}$</td>
</tr>
<tr>
<td>Lost</td>
<td>4.45 $\text{ab}$</td>
<td>(1.59)</td>
<td>3.82 $\text{a}$</td>
</tr>
<tr>
<td>Social</td>
<td>5.10 $\text{b}$</td>
<td>(0.81)</td>
<td>5.04 $\text{b}$</td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly ($p > .05$).

However, the interaction between prospect-refuge and danger threat for fear ratings was found to be significant ($F(4, 288) = 2.59, p < .05, \eta^2 = .04$) (see Fig. 4.6).

*Fig. 4.6. Mean fear ratings for the danger threats as a function of prospect-refuge. (Error bars: 95% CI)*
Further examination of the interaction revealed that across all danger threats, the low prospect-refuge condition received significantly higher fear ratings than the high prospect-refuge condition (see Table 4.12). In the low prospect-refuge conditions, the only significant comparisons involved the social danger threat which received significantly higher fear ratings than both the control and lost danger threats. A similar story was found in the high prospect-refuge conditions. The social danger threat received significantly higher fear ratings than all other danger threats.

Table 4.12.

*Mean fear rating (standard deviation) comparisons between danger threats for both prospect-refuge conditions*

<table>
<thead>
<tr>
<th>Danger threat</th>
<th>Low Prospect-Refuge</th>
<th>High Prospect-Refuge</th>
<th>Test of difference between prospect-refuge condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$M$</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>4.53 $_a$ (2.21)</td>
<td>2.53 $_a$ (1.49)</td>
<td>$t(50.79) = 4.11, p&lt;.001$</td>
</tr>
<tr>
<td>Physical (Animal)</td>
<td>5.62 $_{ab}$ (2.11)</td>
<td>1.96 $_a$ (0.90)</td>
<td>$t(39.17) = 8.74, p&lt;.001$</td>
</tr>
<tr>
<td>Physical (Tripping)</td>
<td>4.64 $_{ab}$ (2.21)</td>
<td>1.88 $_a$ (0.94)</td>
<td>$t(39.75) = 6.28, p&lt;.001$</td>
</tr>
<tr>
<td>Lost</td>
<td>4.13 $_a$ (2.63)</td>
<td>2.50 $_a$ (1.27)</td>
<td>$t(50.79) = 4.11, p&lt;.001$</td>
</tr>
<tr>
<td>Social</td>
<td>6.18 $_b$ (2.26)</td>
<td>4.31 $_b$ (2.74)</td>
<td>$t(42.44) = 3.05, p&lt;.01$</td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly ($p>.05$).

The interaction between danger threat and prospect-refuge for preference was also found to be significant ($F(4, 288) = 6.70, p<.001, \eta^2 = .09$) (see Fig. 4.7).
Fig. 4.7. Mean preference ratings for the danger threats as a function of prospect-refuge. (Error bars: 95% CI)

Further examination of the interaction revealed that across all danger threats with the exception of the social danger threat, the low prospect-refuge condition received significantly lower preference ratings than the high prospect-refuge condition (see Table 4.13). In the low prospect-refuge conditions, both physical danger threats and the social danger threat received significantly lower preference ratings than both the control and lost danger threats. In the high prospect-refuge conditions, the social danger threat received significantly lower preference ratings than all other danger threats.
Table 4.13.

Mean preference rating (standard deviation) comparisons between danger threats for both prospect-refuge conditions

<table>
<thead>
<tr>
<th>Danger threat</th>
<th>Low Prospect-Refuge $M$</th>
<th>High Prospect-Refuge $M$</th>
<th>Test of difference between prospect-refuge condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>3.47 $a$ (1.43)</td>
<td>4.11 $a$ (1.18)</td>
<td>$t(58) = -2.05, p&lt;.05$</td>
</tr>
<tr>
<td>Physical (Animal)</td>
<td>2.41 $b$ (1.22)</td>
<td>4.19 $a$ (1.29)</td>
<td>$t(58) = -5.48, p&lt;.001$</td>
</tr>
<tr>
<td>Physical (Tripping)</td>
<td>2.46 $b$ (1.22)</td>
<td>4.97 $a$ (0.89)</td>
<td>$t(54.89) = -8.99, p&lt;.001$</td>
</tr>
<tr>
<td>Lost</td>
<td>3.66 $a$ (1.75)</td>
<td>4.06 $a$ (1.42)</td>
<td>$t(58) = -1.07, p = .29$</td>
</tr>
<tr>
<td>Social</td>
<td>2.53 $b$ (1.14)</td>
<td>2.98 $b$ (1.95)</td>
<td>$t(46.03) = -1.58, p = .12$</td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly ($p>.05$).

The final interaction tested between danger threat and prospect-refuge for perceived restoration scores was also found to be significant ($F (4, 288) = 4.48, p<.01$, $\eta^2 = .06$) (see Fig. 4.8).

![Mean Perceived Restoration](image)

**Fig. 4.8.** Mean perceived restoration ratings for the danger threats as a function of prospect-refuge. (Error bars: 95% CI)
Further examination of the interaction revealed that with the exception of the social and lost danger threats, the low prospect-refuge condition received significantly lower perceived restoration ratings than the high prospect-refuge condition (see Table 4.14). Once again in the low prospect-refuge conditions, both physical danger threats and the social danger threat received significantly lower perceived restoration ratings than both the control and lost danger threats. In the high prospect-refuge conditions, the social danger threat received significantly lower perceived restoration ratings than all other danger threats.

Table 4.14.
Mean perceived restoration rating (standard deviation) comparisons between danger threats for both prospect-refuge conditions

<table>
<thead>
<tr>
<th>Danger threat</th>
<th>Low Prospect-Refuge</th>
<th>High Prospect-Refuge</th>
<th>Test of difference between prospect-refuge condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$M$</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>5.76 a (1.08)</td>
<td>6.45 a (0.85)</td>
<td>$t(58) = -2.73, p &lt; .01$</td>
</tr>
<tr>
<td>Physical (Animal)</td>
<td>4.82 b (1.02)</td>
<td>6.05 a (1.26)</td>
<td>$t(58) = -4.16, p &lt; .001$</td>
</tr>
<tr>
<td>Physical (Tripping)</td>
<td>4.48 b (1.33)</td>
<td>6.51 a (0.93)</td>
<td>$t(51.86) = -6.73, p &lt; .001$</td>
</tr>
<tr>
<td>Lost</td>
<td>5.79 a (2.07)</td>
<td>6.15 a (1.27)</td>
<td>$t(48.59) = -0.81, p = .42$</td>
</tr>
<tr>
<td>Social</td>
<td>4.54 b (1.36)</td>
<td>4.85 b (1.40)</td>
<td>$t(58) = -0.86, p = .39$</td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly ($p > .05$).

4.4 DISCUSSION

The aim of this study was to examine the effects of specific danger threats on perceptions of danger, fear, preference and restoration within two simulated walks through a country park that differed in levels of prospect-refuge according to Fisher and Nasar’s (1992) typology.

The effect of danger threat

The results found significant main effects of danger threat for all four dependent variables under investigation. However further analysis of the differences between
danger threats yielded some very interesting results. When presented with the physical (tripping), lost or social danger threat, respondents perceived the environment as significantly more dangerous than the control condition. Moreover the social danger threat was perceived as significantly more dangerous than all the other danger threats. However the physical (animal) danger threat was not perceived as any more dangerous than the control condition. The reason behind this is unclear. The manipulation checks indicated that respondents to the physical (animal) danger threat perceived an increased likelihood of encountering a physical danger, suggesting that the manipulation was successful. It is possible that wild boar do not represent an animal that is perceived as particularly dangerous. The use of large animals, predators or venomous creatures is particularly difficult when using examples of natural environments within the United Kingdom because none of these examples are indigenous. In hindsight, the manipulation of a physical danger threat may have proved more successful if a more fear-evoking creature had been used. McNally (1987) states that fears of snakes, spiders and other pretechnical objects are overrepresented amongst the population indicating that humans have become biologically prepared to respond with fear and avoidance behaviour to natural stimuli that threatens survival. Future research into the area may like to use these types of creatures when manipulating the threat of encountering a source of physical danger.

The social danger threat evoked significantly more fear than both the control condition and all the other danger threats. The previous study found that it was the perceived likelihood of encountering a social danger that had the strongest positive effect on fear and the results of this study further corroborate the fear-evoking nature of social danger. The previous study also suggested that the perceived likelihood of encountering a physical danger did not have a significant effect on fear. The results of this study also suggest a similar pattern because the threat of a physical danger did not appear to evoke fear. Previous research has demonstrated that positive as well as negative emotions are reported by people who overcome physical obstacles and threats within natural environments (e.g. Kaplan & Talbot, 1983; van den Berg & ter Heijne, 2005). It may well be that confronting dangerous elements of nature may have resulted in some positive emotions that dilute fear.
The finding that the lost danger threat was not significantly more fear-evoking than the control condition was somewhat surprising given that the perceived likelihood of becoming lost was found to have a significant effect on fear in the previous study. The danger of becoming lost is one that builds up and is rather subjective because people are likely to have different thresholds for the point that constitutes feeling lost. Therefore threat manipulated through the knowledge that other people have become lost may not be as fear-evoking as if one becomes lost themselves. It is also possible that the lost manipulation was not as effective as the other manipulations. In addition to people having different thresholds, it is possible that the use of sequential slides may make it harder for respondents to imagine becoming lost. Although the manipulation checks for the lost danger threat were largely successful, the significance of the differences between conditions compared to the other manipulation checks were somewhat weaker. The manipulation of a lost danger threat may therefore not be as successful as the threats manipulated because of its subjective nature. On a positive note, this may mean that knowledge of other people becoming lost in a natural environment may not represent a fear-evoking threat that is likely to damage preference towards and the perceived restorative value of a natural environment.

With the exception of the physical (animal) danger threat, the social danger threat was found to be significantly less preferred than all the other danger threats. Rather unsurprisingly, the social danger threat was also found to be perceived as less restorative than all the other danger threats. The only other significant difference was that the physical (tripping) danger threat was found to be perceived as less restorative than the control condition. This finding may be because injury from tripping over natural obstacles is more likely to result in discomfort rather than a threat to survival. In support of this, the physical (tripping) danger threat was perceived as no more dangerous or fear-evoking than the control condition. However the need to avoid obstacles and navigate along unstable paths may result in an individual having to direct attention and be more physically active to help prevent tripping over. This is not conducive to restoration and could result in the walk being perceived as less restorative despite it not being perceived as any more dangerous or fear-evoking. Consistent with this idea, dissemination of the perceived restoration measure into its four dimensions revealed that the physical
(tripping) danger threat was perceived as significantly less physiologically restorative than the control condition. With the exception of perceived physiological restoration, the analysis also revealed that the social danger threat was perceived as significantly less restorative for all four dimensions of perceived restoration than both the control and all the other danger threats.

What is apparent from these results is that of the danger threats manipulated, it is a social danger threat that consistently produces more negative perceptions of a natural environment than in the absence of any specific danger threat. Not only is a social danger threat perceived as more dangerous and fear-evoking than all the other danger threats, but with a couple of exceptions, a social danger threat in a country park environment is also significantly less preferred and perceived as less restorative. To the researcher's knowledge, no positive emotions have been documented in response to encounters of social danger in a natural environment and because it represents an extreme threat to survival, it is unsurprising that people perceive an environment as more dangerous and fear-evoking if they have knowledge of a prior incident occurring within the environment that are exposed to. The previous study demonstrated that positive experiences within an environment such as levels of preference and perceived restoration are damaged by perceptions of danger and particularly fear. It is therefore unsurprising that we find that a simulated walk through an environment where an individual has knowledge of a prior social danger incident is far less preferred and perceived as less restorative than in the absence of that knowledge. This makes sense from an intuitive perspective but also a theoretical one. ART (Kaplan, 1995; Kaplan & Kaplan, 1989) states that the recovery of attentional fatigue requires amongst other things, a setting that is compatible to restoration. If it is not, the individual has to direct attention to overcome the incompatibility and this would disrupt the restoration process. When walking through an environment where one knows that a social danger incident has occurred, one is likely to be weary and use effortful attention to remain vigilant and keep an eye out for any potential offenders. This would prevent the renewal of effortless attention and result in far less restoration than a more compatible safe environment. The heightened arousal associated with vigilance is also likely to manifest itself in a physiological response that is counteractive to the restoration process. Perceptions of
restoration may be used as an implicit frame of reference for preference judgements (Purcell et al., 2001) and generally speaking, perceptions of danger and fear tend to be disliked. It is therefore unsurprising that a simulated walk through an environment where an individual has knowledge of a prior social danger incident also tends to be less preferred than in the absence of that knowledge.

The dissemination of perceived danger into its three items also revealed some interesting findings. Significant differences in the perceived likelihood and severity of the danger were found between the four danger threats. The social danger threat was perceived as significantly more likely to be encountered and also more severe than the other danger threats. Both the physical danger threats were perceived as being significantly more severe dangers than the lost danger threat. As previously mentioned, the danger of becoming lost is somewhat different to social and physical dangers. Becoming lost is rather more subjective and may build up rather than being forced upon people. It was found to be perceived as less severe and more controllable than the other three danger threats. One possible explanation is that because of mobile phones, people may feel that if they become lost, they can alert others to come to their assistance.

*The effect of prospect-refuge*

The physical structure of the country park was once again manipulated using Fisher and Nasar’s (1992) typology of prospect-refuge. Significant expected differences in perceived danger and fear were found between the two prospect-refuge conditions, with the simulated walk through the low prospect-refuge environment associated with significantly higher ratings of perceived danger and fear than the high prospect-refuge walk. These findings are consistent with those of the previous chapter and support existing work that has demonstrated that the manipulation of perception and information-based variables can evoke significant differences in perceptions of overall danger and fear in natural environments (e.g. Chapin, 1991; Herzog & Kirk, 2005; Herzog & Kropscott, 2004; Herzog & Kutzli, 2002; Schroeder & Anderson, 1984). Not only do the results once again support the use of Fisher and Nasar’s (1992) typology of prospect-refuge within a natural environment, but also suggest that the typology can
explain differences in perceived danger and fear in response to specific danger threats. Significant expected main effects of preference and perceived restoration were also found with higher levels of prospect-refuge being more preferred and perceived as more restorative. As was posited in the previous chapter, this is presumably because a high prospect-refuge environment affords a higher level of safety. Higher levels of prospect and accessibility combined with less hiding places for an offender means that a potential victim is better prepared to take action against any hypothetical threat that they may encounter. Given the reported negative relationship between perceived danger/fear and preference/perceived restoration in the previous chapter, a safer and less fear-evoking environment is more likely to be preferred and be perceived as restorative.

Interactions

The analysis revealed some interesting interactions between danger threat condition and level of prospect-refuge. Although no significant interaction was found for perceived danger, significant interactions were found for fear, preference and perceived restoration.

Despite the absence of a significant interaction for perceived danger, unlike the other conditions, the high prospect-refuge social danger threat was perceived as equally dangerous as the low prospect-refuge social danger threat. In respect to all the other danger threats, the high prospect-refuge environment was perceived as less dangerous than the low prospect-refuge environment. The high prospect-refuge environment was also found to be less fear-evoking than the low prospect-refuge environment for all five danger threats. The high prospect-refuge environment was also more preferred and perceived as more restorative than the low prospect-refuge environment for the control condition and both physical danger threats. However there were no significant differences in preference or perceived restoration between prospect-refuge conditions for both the lost and social danger threats.

Within the low prospect-refuge environment, despite the social danger threat being perceived as more dangerous and fear-evoking than the control condition, it was no different to any of the other danger threats. The social danger threat was also less
preferred and perceived as less restorative than the control condition and the lost danger threat, but not significantly different to either of the physical danger threats. However in the high prospect-refuge environment, the social danger threat was perceived as more dangerous and fear-evoking but less preferred and restorative than all the other danger threats. Therefore these results imply that the effects of specific danger threats are much more similar within a low prospect-refuge environment as opposed to a high prospect-refuge environment. Within a high prospect-refuge environment, the effect of a social danger threat seems much more pronounced relative to the other danger threats. This may be as a result of people perceiving a high prospect-refuge environment to be a safer environment where one is unlikely to be attacked. The knowledge that an incident of social danger occurred in the environment may have a greater effect than in a low prospect-refuge environment because of the unpleasant surprise that such an incident occurred in such an apparently safe environment. The potential practical implications of this are clear. Manipulating the physical structure of a natural environment so that it forms an example of a high prospect-refuge may help ensure an environment is still perceived in a positive light in the absence of any specific danger or in the presence of a physical danger threat. However in the presence of a social danger threat, it appears to make no noticeable difference. Further research needs to be conducted to see if this is a consistent finding in response to social danger in a high prospect-refuge environment.

4.5 THE NEXT STEP FOR THIS THESIS

The previous study explored the perceived likelihood of encountering different types of danger in the absence of any manipulation whilst this study explored the effects of different types of danger threat manipulations. Therefore the next logical step for this research to take is to manipulate the imagined presence of a danger and explore the effects on perceptions of walking through that environment. Ethical guidelines invariably mean that the manipulation of danger will once again have to be imagined and that a simulation methodology will have to be used. However the simulation method has become an accepted technique for investigating environmental preference and perceived restoration in both urban and natural environments (cf. Stokols, 1993). The
results of the studies so far demonstrate that different types of danger may have different effects on and relationships with both positive and negative perceptions within a natural environment. Of the types of danger examined, social danger appears to evoke the most fear and be perceived as the most dangerous. It also appears to have the greatest negative effect on perceived restoration and preference. Unlike the other types of danger investigated, prospect-refuge appears less successful in managing perceptions of an environment when people perceive a threat of social danger. The effects of prospect-refuge on perceptions in the presence of an imagined social danger are unclear. Because social danger appears so detrimental to the positive experiences such as preference and perceived restoration people may experience from the recreation and exploration of natural environments, it seems wise to focus on the effects of encountering this type of danger because of the practical implications it poses.
CHAPTER 5

THE EFFECT OF SOCIAL DANGER ON NATURE EXPERIENCES

5.1 INTRODUCTION

The aim of this research study is to follow on from the previous one by manipulating the imagined presence of a social danger when walking through a simulated natural environment. Of the dangers investigated, the studies conducted in the previous research chapters have demonstrated social danger to be the most detrimental in terms of perceived restoration and preference. Interesting effects have also been found in relation to the interaction of social danger with the physical structure of the environment. Of particular interest is how social danger impacts on perceived restoration. Unlike other types of dangers, the perception of encountering a social danger is judged equally likely between prospect-refuge environments. Moreover the threat of a social danger has no significantly lesser effect on perceived restoration if one is walking through a high prospect-refuge environment as opposed to a low prospect-refuge environment. With natural environments such as country parks being valuable tools to help protect the physiological and psychological health of people that visit them, it is imperative that we understand the full extent of what such a detrimental danger can do. Carrying on from the research of the previous two chapters, it was felt that the manipulation of the presence of a social danger was the next logical step to take.

Summary of relevant research

The association between perceptions of danger and fear on preference within natural environments has received some attention by Herzog and his colleagues. However the effects of perceptions of danger and fear on perceived restoration have been largely ignored by previous research. Although the studies in the previous chapters
have found very similar directional effects of danger and fear on perceived restoration and preference, the effects appear to be more pronounced on perceived restoration. It is hoped that focussing on exploring the effects of danger and fear on perceived restoration will produce a more novel and interesting contribution to the research area and so unlike the preceding research studies, this study will not use preference as a dependent variable.

The physical structure of the environment will once again be manipulated using Fisher and Nasar’s (1992) typology of prospect-refuge. By examining the impact of social danger while manipulating the physical structure of the environment, practical implications for the environmental design of these environments may be found to help protect their perceived restorative value. This study will therefore focus exclusively on how an imminent social danger of varying severity affects perceptions of danger, fear and restoration across two simulated natural environments that once again vary in prospect-refuge according to Fisher and Nasar’s (1992) typology.

*Methodological issues*

The use of simulation techniques only makes it harder to detect any real effects and so it makes sense to try to adopt the most realistic simulation technique possible. Of the simulation techniques currently available, one would expect the use of video to offer an improvement over photographs. This is because video better represents a walk by including coherent movement through an environment. The inclusion of sound is also important. Huang, Parsons and Tassinany (2004) claim that human perception is multi-modal and so the inclusion of sound, motion and multiple views might better reflect human interaction with an environment, increasing ecological validity. Supporting this, Gibson (1979) claims that movement enhances the process of perceiving environmental features while Heft and Nasar (2000) found a higher motivational value of dynamic over static displays. Not only do videos appear to depict a natural environment more realistically than photos, but immersive video projections of a natural environment on a large screen and in high resolution may be more likely to find significant effects than less immersive projections. Manipulating level of immersion, De Kort et al. (2006) found that a more immersive video projection of a natural environment enhanced
restorative potential. This makes sense as both main theories of restoration (SRT [Ulrich, 1983]; ART [Kaplan & Kaplan, 1989]) emphasise the importance of natural features. A more realistic and immersive simulation should provide a deeper sense of presence so that an individual feels closer to these natural features. Therefore when using simulation techniques, the use of a large high-resolution projection of a walk through a natural environment does not only appear more realistic and ecologically valid, but also results in the greatest chance of finding significant effects, particularly for restoration. Therefore this study will try to adopt a highly immersive simulation methodology.

The studies in the previous two chapters asked respondents to complete an online questionnaire at the end of a tiring working day. Although manipulation checks using the POMS-SF in the latter chapter revealed a high level of mood disturbance without significant differences between conditions, this study will involve participants completing the experiment within a laboratory at different times of day. This means that an alternative method will need to be devised to manipulate participant’s emotional and attentional state so that they are in a state conducive to restoration. An amended Stroop computer-based fatigue task that uses colours and shapes was therefore developed specifically for use in this study (details in method).

The effects of social danger

The previous two chapters demonstrated that perceptions of social danger can be highly detrimental to the perception of a natural environment. When an environment becomes associated with social danger, people perceive the environment as more dangerous and fear-evoking but less preferred and restorative than in the absence of this association. This study will focus exclusively on social danger by using scenarios to manipulate an imagined presence of social danger during a simulated walk through a country park. Three scenarios were devised to be used – no, moderate and high. The no social danger scenario involved no manipulation and acted as a control condition. The high social danger scenario described a very severe and threatening social danger whereby a stranger is explicitly following the participant along the walk. However
because these two scenarios represent extremes, a moderate danger scenario was included whereby somebody was walking behind the participant but a long way back. It was felt that the wording ‘walking behind’ as opposed to ‘following’ represented a far less extreme and more realistic encounter of social danger. It was felt that this would result in the effects of the moderate social danger scenario falling somewhere between the two other social danger scenarios.

Unlike encounters with physical danger, no positive emotions have been documented in response to encounters with social danger in natural environments, presumably because generally speaking, social danger harbours such an extreme threat to survival. Serious dangers that threaten survival often trigger fear (Ruiter et al., 2001) and this often elicits a coping mechanism in which an individual attempts to avoid or reduce the threatening situation (Keane, 1998). Indeed Burgess (1998) states that the myth of a safe countryside does not appear to be undermined by the fear of ‘natural’ hazards such as darkness or supernatural spirits but it is the same muggers and rapists as feared by people in urban environments. Because of the serious implications of encounters with social danger, it is likely to be perceived as dangerous and evoke fear. The previous research from the preceding chapters supports this claim. The perceived likelihood of encountering a social danger has a strong positive effect on both perceived danger and fear. Knowledge that a social danger had occurred in the environment respondents were asked to imagine walking through has also been found to result in significantly higher ratings of perceived danger and fear to be expressed.

But how is social danger likely to effect perceived restoration? Once again the previous research in this thesis suggests that encounters of social danger will reduce the perceived restorative value of a walk through a natural environment. The reason for this appears pretty straightforward. Both main theories of restoration advocate the need for a compatible environment conducive to restoration for the process to occur. From an SRT perspective, restoration requires a calming environment devoid of stress that facilitates the replacement of negative emotion by positive emotion. Encounters of social danger evoke negative emotions such as fear and mobilise the stress response, the exact state restoration attempts to overcome. In ART, the recovery of attentional fatigue requires amongst other things, a setting that is compatible to restoration. If it is not, the individual
has to direct attention to overcome the incompatibility and this would disrupt the restoration process. In dangerous situations such as encounters of social danger, effortful attention would be directed on tasks such as vigilance and trying to figure out what to do (S. Kaplan, 2001). Empirical work to date testing this assumption has been very limited. However a recent study by Herzog and Rector (2009) provides further support by finding that the presence of an imminent social danger severely depressed the perceived likelihood of restoration.

The effect of prospect-refuge

Fisher and Nasar’s (1992) typology of prospect-refuge was once again used as a way of manipulating the physical structure of the environment. Based on Appleton’s (1975) prospect-refuge theory, the typology attempts to explain an individual’s perceptions of an environment based on the levels of prospect, refuge and accessibility. Urban environments that are low in prospect, contain a high level of refuge for a potential offender to hide and offer an impeded escape for a potential victim are perceived as less safe/more dangerous, evoke a higher fear of crime and are less preferred than environments high in prospect, that contain a low level of refuge for a potential offender and offer a quick escape for a potential victim (e.g. Fisher & Nasar, 1992; Nasar & Jones, 1997; Petherick, 2000/2001; Wang & Taylor, 2006).

However the studies from the previous two chapters have found some interesting findings regarding the use of Fisher and Nasar’s (1992) typology in response to perceptions and threats of social danger. In terms of the perceived likelihood of encountering a social danger in a country park environment, no significant differences were found between different levels of prospect-refuge. Even a heightened threat of encountering a social danger revealed some unexpected results in the previous chapter. Although fear ratings in the low prospect-refuge environment were significantly higher than in the high prospect-refuge condition, no significant differences in perceived danger or preference were found between the two prospect-refuge conditions. These results are somewhat surprising as one would expect the typology to be most successful in manipulating perceptions of an environment in response to social danger threat because
the typology is based around explaining perceptions of safety from a potential attacker. However the previous two chapters have only examined the perceived likelihood of encountering a social danger and manipulated the threat of encountering social danger. This chapter will manipulate the imagined presence of a social danger. It seems plausible that the physical structure of the environment will have a greater impact on perceptions of an environment because the presence of a danger is more immediate than the threat of encountering the danger. Therefore it is still expected that a walk through a simulated low prospect-refuge country park would be perceived as more dangerous (hypothesis 4) and fear-evoking (hypothesis 5) than a walk through a simulated high prospect-refuge environment. We can also infer that lower levels of prospect-refuge are likely to result in significantly lower ratings of perceived restoration (hypothesis 6). As previously mentioned, perceptions of danger and fear are clearly counter to the restoration process and so if an environment is perceived as dangerous and fear-evoking, then it is not likely to be perceived as restorative. Results from previous chapters have not only demonstrated that lower levels of prospect-refuge are perceived as less restorative than higher levels, but clear relationships have been stated, with both perceived danger and fear found to have a significant negative effect on perceived restoration. It is also possible that Herzog and Rector’s (2009) study may have inadvertently explored the role of the physical structure of an environment on the perceived likelihood of restoration in response to a social danger. Although respondents were given a short description of the environment they were asked to imagine taking a walk through, it was fairly nondescript in regard to the physical characteristics of the environment and was immediately followed by the danger manipulation. Because no visual representation of the walk was presented, it is possible that people imagined different variations of the nature trail they were asked to imagine walking through as a result of whether they were given the social danger manipulation. For example, as the social danger manipulation involved someone following them, respondents may have imagined walking through a nature trail with a physical structure that facilitates following someone e.g. shadow, boundedness, places to hide etc. The perceived restorative values of these variations themselves may differ, regardless of whether a danger is presented or not. Therefore the results may be questionable because the same
walk through the nature trail was not imagined by respondents as a result of their having either the social danger or no danger manipulation. Once again this possibility highlights the potential for the physical structure of the environment to influence perceptions of restoration, particularly when in the presence of a specific danger.

The manipulation of prospect-refuge in addition to danger scenario means that there is a potential opportunity for an interaction between the two. Any possible interactions could yield a deeper insight into how environmental design affects perceptions of danger, fear and restoration within a natural environment when an individual finds themselves confronted by a social danger. Given that this is very much an unexplored area in existing research, it seems prudent to test for interaction effects on the variables under investigation (perceived danger, fear and perceived restoration).

5.2 METHOD

Participants and design

Fifty-one participants consisting of undergraduate and postgraduate students from the University of Surrey Human Sciences Department were recruited in exchange for course credit (36 female; \( M = 21.78 \) years, \( SD = 6.60 \) years; 18-44 years). A mixed model design was employed whereby participants were randomly assigned to one of three experimental danger conditions (no, \( n = 17 \); moderate, \( n = 17 \); high, \( n = 17 \)). This formed the single between-subject factor. Two videos of walks through a country park that differed according to Fisher and Nasar’s (1992) typology were created for use in this chapter (low, high). Participants viewed both videos of the walks separately and this formed the single within-subjects factor. The presentation order of the walks were counterbalanced to prevent order effects, and once assigned to a danger condition, participants viewed both videos within the same danger condition. All data was collected within a three-week period in December 2008.
Fatigue task

To ensure participants were in a negative emotional and cognitively depleted state before starting the experiment, they were asked to complete a computer-based fatigue task. The task was an amended Stroop task created using E-Prime 2.0 that used both colours and shapes. Participants took a seat in front of a PC with a 19 inch monitor and were presented individual trials where a coloured shape (triangle, square, rhombus, pentagon and hexagon in red, blue, black, white, yellow or green) appeared in the centre of the screen. At the same time, a word describing either a colour or shape appeared at the top of the screen. Participants had to indicate whether or not the word was related to the coloured shape by pressing the ‘y’ key if it was related and the ‘n’ key if it was not related. The word was deemed to be related if it accurately described either the shape or the colour of the coloured shape that was presented in the middle of the screen. For example, if a red triangle was presented, if the word ‘red’ or ‘triangle’ appeared above it, it was deemed to be related, whilst if the word ‘green’ or ‘square’ appeared, it was deemed to be unrelated. After each response, a new trial began which was randomly selected by the computer. This continued for five minutes. In an attempt to get participants to really concentrate on the task, they were instructed that they would be scored on how quickly and how accurately they responded. During the task, participants were also given a set of headphones playing building construction sounds in an attempt to distract them from the task, thus placing an even higher demand on attentional capacity.

A pilot test with a small group of undergraduate and postgraduate Psychology students (n = 12; 7 female; M = 20.50 years, SD = 1.75 years; 18-25 years) revealed that the task was successful in depleting attention, evoking more negative emotion and increasing the body’s physiological response. Attention, as measured by the Necker Cube Pattern Task, was significantly lower immediately after completing the fatigue task (M = 6.12, SD = 1.44) than before starting it (M = 4.21, SD = 1.79; t(11) = -2.88, p<.01). Completing the task also had a significant effect on reducing positive emotion as measured by the positive affect factor from the ZIPERS. Positive affect was significantly reduced by completing the fatigue task (M = 1.94, SD = 0.53) when compared to levels
before starting it \((M = 3.75, SD = 0.67; t(11) = -7.71, p<.001)\). The fatigue task also significantly increased heart rate (measured in beats per minute) from before starting the task \((M = 72.30, SD = 10.63)\) to immediately after completing the task \((M = 87.60, SD = 11.24; t(11) = -3.43, p<.01)\).

**Environmental simulations**

Two videos of walks through The Queen Elizabeth Country Park near Portsmouth, England were created for use in the study. The park contains a diverse range of habitats from calcareous grassland and yew woodland to coniferous and beech plantations spread over more than 1400 acres that can be explored by walkers, cyclists and horse riders. Two walks were chosen through areas of the country park that differed according to Fisher and Nasar’s (1992) typology. The low prospect-refuge walk contained low levels of prospect and accessibility but a high number of potential hiding places, whereas the high prospect-refuge walk contained high levels of prospect and accessibility but a low number of potential hiding places. The researcher then made both walks at the same speed and recorded them from a first person perspective using a Samsung DV381 videocamera. The recordings also included an audio recording from the background noise from the walk. The walks were recorded in one minute segments consisting of several walking segments interjected with a number of short pauses and 360 degree panoramic scans before continuing into the next segment. Both videos lasted for a total of ten minutes and were recorded on the same sunny morning in July. No people were visible or audible in either of the videos.

A pilot test with a small group of undergraduate and postgraduate Psychology students \((n = 12; 7 \text{ female}; M = 20.50 \text{ years}, SD = 1.75 \text{ years}; 18-25 \text{ years})\) was conducted to ensure the manipulation of prospect-refuge was successful. Each respondent viewed both videos but the order was randomised to prevent order effects. One item was used to measure prospect “How clear is your view allowing your field of vision to extend deep into the scene?”, one item to measure accessibility “How easily do you think you could move through the scene?” and one item to measure the number of hiding places for a potential offender “How many potential hiding places and
opportunities for concealment are there for another person?" The response options all ranged from 1 (not at all clear/ not at all easily/ very few hiding places) to 7 (very clear/ very easily/ many hiding places). Expected significant differences were found in all three dimensions of prospect-refuge with the high prospect-refuge simulation being perceived as containing greater levels of prospect and accessibility but a lower number of potential hiding places for an attacker than the low prospect-refuge simulation (see Table 5.1).

Table 5.1.

<table>
<thead>
<tr>
<th>Dimension of prospect-refuge</th>
<th>Prospect-refuge simulation</th>
<th>t test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>
| Prospect                     | 2.97| 5.02       | $t(11) = -4.04, p<.001$
| Hiding places                | 6.11| 2.84       | $t(11) = 6.21, p<.001$
| Accessibility                | 4.10| 6.23       | $t(11) = -3.63, p<.001$

The videos were projected onto a white-washed wall of the laboratory using a Sony VPL-EPX5+ digital projector to a size of 307cm x 230cm with the audio recordings were played using the projector’s integrated speakers. Figs. 5.1 and 5.2 are photographic stills taken from the low prospect-refuge video, while Figs. 5.3 and 5.4 are taken from the high prospect-refuge video.
Fig. 5.1. Example 1 scene from video of low prospect-refuge walk

Fig. 5.2. Example 2 scene from video of low prospect-refuge walk
Fig. 5.3. Example 1 scene from video of high prospect-refuge walk

Fig. 5.4. Example 2 scene from video of high prospect-refuge walk
Danger scenarios

Before viewing each video of the walk, participants read a short description instructing them to imagine that they were making the walk for real. Each description also made reference to the level of danger they were to imagine according to the experimental danger condition they were assigned. The descriptions also made indirect reference to levels of prospect, accessibility and hiding places by describing physical features such as light, vegetation, obstructions and pathways of the environment. This was done to help reinforce the physical structure of the environment they were going to see in the video and were asked to imagine walking through. Six different descriptions (danger condition x prospect-refuge condition) were created and can be seen in appendix C.

Measures

Perceived danger was measured using 3 items that made specific reference to social danger: “How likely do you think it is that you could be attacked by another person during your walk through this environment? How severe is the danger of being attacked by another person when walking through this environment? What level of control do you feel you have over the danger of being attacked when walking through this environment?” Because of the wording of the item, ratings of perceived control were then reversed. The response options once again ranged from 1 (not at all) to 7 (very much so) and permitted a scale score (mean response) that ranged from 1 (perceived as not at all dangerous) to 7 (perceived as very dangerous). The scale had a good level of internal consistency (Cronbach’s α = .84) with an inter-item correlation of .54.

Fear was measured using 3 items: “How frightened would you be taking a walk through this environment? How scared would you be taking a walk through this environment? How uneasy would you be taking a walk through this environment?” The response options ranged from 1 (not at all) to 7 (very much so) that permitted a scale score (mean response) that ranged from 1 (perceived as not at all fear evoking) to 7
(perceived as very fear evoking). The scale had high internal consistency (Cronbach’s $\alpha = .87$) with an inter-item correlation of .70.

Perceived restoration was once again measured using Han’s (2003) self-rating restoration scale (SRRS) that consists of eight items spread evenly across four dimensions of perceived restoration (emotional, physiological, cognitive and behavioral). The overall scale was once again found to have very high internal consistency (Cronbach’s $\alpha = .90$) with a mean correlation between the 8 items of .53. Each of the four dimensions were also found to have a more than satisfactory level of internal consistency (Emotional, Cronbach’s $\alpha = .88$; Physiological, Cronbach’s $\alpha = .80$; Cognitive, Cronbach’s $\alpha = .81$; Behavioral, Cronbach’s $\alpha = .98$).

The detailed initial model of the SRRS hypothesizes 4 dimensions and confirmatory factor analysis using SAS program using the data from all three conditions indicated a good fit between the hypothesized model and the collected data (see Table 5.2).

Table 5.2.

<table>
<thead>
<tr>
<th>Model fit criteria of the SRRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\chi^2$ (favourable value &lt;3.0)</td>
</tr>
<tr>
<td>-----------------------------</td>
</tr>
<tr>
<td>1.12</td>
</tr>
</tbody>
</table>

Multicollinearity did not appear to be a problem as none of the correlations between the four dimensions were found to be greater than 0.85. Values less than this can be considered as showing an acceptable level of discriminant validity (Kline, 1998). A good level of convergent validity was also demonstrated with high loadings (all $R^2 > .50$) of each set of variables on their common underlying factor.

Manipulation check items were included to ensure the simulations were a realistic depiction of a walk within a country park, participants were also asked: “Do you feel the photographs and description just shown to be a representative example of a walk through a typical country park in the United Kingdom?” The ratings ranged from 1 (not at all) to 7 (very much so).
Procedure

Upon entering the laboratory, participants completed the computer based attention fatigue task before reading the short description of the walk and the danger scenario. They then took a seat that was positioned 400 cm from and directly facing the laboratory wall where the video was to be projected on. During the video of the walks, the laboratory lights were switched off to aid the clarity of the projection. At the end of the video, participants were given a questionnaire that consisted of four groups of measures (SRRS, fear, perceived danger and manipulation check items). The order in which participants completed these groups of measures was randomised to prevent order effects. After they had completed the questionnaire, participants were taken to a nearby common room and given ten minutes to relax, read magazines and have a hot drink. They were then asked back into the laboratory and to complete the whole process from the attention fatigue task for a second time. However this time, participants viewed the video of the walk they had not seen after reading an identical danger scenario but with a description of the physical structure of the second walk. The whole procedure took approximately forty minutes.

5.3 RESULTS

Manipulation checks

No significant differences in age ($\chi^2 (2) = 0.05, p = .98$) or gender ($\chi^2 (2) = 0.11, p = .95$) were found between the single between-subject factor (danger condition). The two simulations were also found to be perceived as equally real (Low prospect refuge simulation $M = 5.26, SD = 1.12$; high prospect refuge simulation $M = 5.30, SD = 1.16$; $t(49) = -0.18, p = .86$). Ratings of the reality of the simulations were also not found to differ significantly between the three danger scenarios ($F (2, 97) = 0.75, p = .47$). As can be seen in Table 5.3, planned contrasts revealed that none of the three danger scenarios differed significantly from either of the others in terms of how real the simulations were judged.
Table 5.3.

*Reality ratings (standard deviation) and test of difference between the three danger scenarios*

<table>
<thead>
<tr>
<th>Danger scenario</th>
<th>M</th>
<th>(SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>5.47</td>
<td>(1.16)</td>
</tr>
<tr>
<td>Moderate</td>
<td>5.22</td>
<td>(1.16)</td>
</tr>
<tr>
<td>High</td>
<td>5.15</td>
<td>(1.11)</td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly ($p>.05$).

*Effect of danger scenario*

As can be seen in Table 5.4, a series of one-way between subjects ANOVAs revealed that although no significant main effect of danger scenario was found for perceived danger (*hypothesis 1*), significant main effects were found for both fear (*hypothesis 2*) and perceived restoration (*hypothesis 3*).

Table 5.4.

*Main effect results of danger scenario for the three main variables under investigation*

<table>
<thead>
<tr>
<th></th>
<th>ANOVA</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived danger</td>
<td>$F (2, 95) = 1.80, p = .14, \eta^2 = .06$</td>
<td></td>
</tr>
<tr>
<td>Fear</td>
<td>$F (2, 95) = 6.51, p&lt;.01, \eta^2 = .12$</td>
<td></td>
</tr>
<tr>
<td>Perceived restoration</td>
<td>$F (2, 95) = 8.36, p&lt;.001, \eta^2 = .15$</td>
<td></td>
</tr>
</tbody>
</table>

A series of Tukey HSD post-hocs were conducted to examine the differences between the three danger scenarios (see Table 5.5). The high danger scenario was perceived as more dangerous, fear-evoking and perceived as less restorative than the no danger scenarios. It was also more fear-evoking and perceived as less restorative than the moderate danger scenario. No significant differences were found between the no and moderate danger scenarios.
Table 5.5.

*Mean ratings (standard deviation) for the three danger scenarios with Tukey HSD post-hoc comparisons*

<table>
<thead>
<tr>
<th>Danger scenario</th>
<th>Perceived danger</th>
<th>Fear</th>
<th>Perceived restoration</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>2.98&lt;sub&gt;a&lt;/sub&gt; (1.84)</td>
<td>2.68&lt;sub&gt;a&lt;/sub&gt; (1.28)</td>
<td>5.78&lt;sub&gt;a&lt;/sub&gt; (1.74)</td>
</tr>
<tr>
<td>Moderate</td>
<td>3.39&lt;sub&gt;b&lt;/sub&gt; (2.16)</td>
<td>2.97&lt;sub&gt;a&lt;/sub&gt; (1.38)</td>
<td>5.19&lt;sub&gt;a&lt;/sub&gt; (1.94)</td>
</tr>
<tr>
<td>High</td>
<td>3.78&lt;sub&gt;b&lt;/sub&gt; (1.89)</td>
<td>3.59&lt;sub&gt;b&lt;/sub&gt; (1.23)</td>
<td>4.33&lt;sub&gt;b&lt;/sub&gt; (1.63)</td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly (p>.05).

The measure of perceived danger used in this study consisted of 3 items (perceived likelihood, severity and control of danger). By also examining the item responses using one way between-subjects ANOVAs, it was felt that a deeper understanding of the underlying factors of specific type of dangers could be gained. No significant differences were found between the three danger scenarios for either ratings of perceived likelihood (F (2, 48) = 2.53, p = .09), severity (F (2, 48) = 1.47, p = .14) or control of danger (F (2, 48) = 0.82, p = .45). However as can be seen in Table 5.6, some of the Tukey’s HSD post-hoc comparisons were found to be significant. Although all three danger scenarios were perceived as harbouring an equally severe danger, the high danger scenario was perceived as having a greater likelihood of encountering a severe danger than the other two danger scenarios. The high danger scenario was also perceived as having significantly less control than the no danger scenario.

Table 5.6.

*Mean perceived danger item ratings (standard deviation) for the three danger scenarios with Tukey HSD post-hoc comparisons*

<table>
<thead>
<tr>
<th>Danger scenario</th>
<th>Perceived likelihood</th>
<th>Perceived severity</th>
<th>Perceived control</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>2.65&lt;sub&gt;a&lt;/sub&gt; (1.80)</td>
<td>3.31&lt;sub&gt;a&lt;/sub&gt; (1.80)</td>
<td>4.26&lt;sub&gt;a&lt;/sub&gt; (1.92)</td>
</tr>
<tr>
<td>Moderate</td>
<td>2.71&lt;sub&gt;a&lt;/sub&gt; (2.06)</td>
<td>3.66&lt;sub&gt;a&lt;/sub&gt; (2.23)</td>
<td>3.72&lt;sub&gt;ab&lt;/sub&gt; (2.16)</td>
</tr>
<tr>
<td>High</td>
<td>3.96&lt;sub&gt;b&lt;/sub&gt; (1.88)</td>
<td>3.50&lt;sub&gt;a&lt;/sub&gt; (1.94)</td>
<td>3.12&lt;sub&gt;b&lt;/sub&gt; (1.82)</td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly (p>.05).
The SRRS measure of perceived restoration consists of four dimensions and once again, it was felt that exploring whether danger scenario had a greater effect on one dimension of perceived restoration than another could improve our understanding of the area. Analyses using one way between-subjects ANOVAs revealed significant differences between the three danger conditions for all four dimensions of perceived restoration (see Table 5.7). Significant Levene’s test results for the emotional and physiological dimensions meant that the Welch correction was adopted.

Table 5.7.

Main effect results of danger scenario for the four dimensions of perceived restoration

<table>
<thead>
<tr>
<th>Dimension</th>
<th>ANOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotional</td>
<td>$F (2, 62.74) = 7.79, p&lt;.01, \eta^2 = .12$</td>
</tr>
<tr>
<td>Cognitive</td>
<td>$F (2, 97) = 3.78, p&lt;.03, \eta^2 = .07$</td>
</tr>
<tr>
<td>Physiological</td>
<td>$F (2, 61.31) = 4.73, p&lt;.03, \eta^2 = .07$</td>
</tr>
<tr>
<td>Behavioural</td>
<td>$F (4, 97) = 3.65, p&lt;.03, \eta^2 = .07$</td>
</tr>
</tbody>
</table>

As can be seen in Table 5.8, the high danger scenario received significantly lower ratings of perceived emotional, cognitive, physiological and behavioural restoration than the no danger scenario. The differences in perceived restoration dimension ratings between the moderate and high danger scenarios were not significant.

Table 5.8.

Mean perceived restoration dimension ratings (standard deviation) for the three danger scenarios with Tukey HSD post-hoc comparisons

<table>
<thead>
<tr>
<th>Danger scenario</th>
<th>Emotional</th>
<th>Cognitive</th>
<th>Physiological</th>
<th>Behavioural</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>5.97&lt;sub&gt;a&lt;/sub&gt; (2.11)</td>
<td>6.01&lt;sub&gt;a&lt;/sub&gt; (2.12)</td>
<td>5.93&lt;sub&gt;a&lt;/sub&gt; (2.02)</td>
<td>5.21&lt;sub&gt;a&lt;/sub&gt; (2.55)</td>
</tr>
<tr>
<td>Moderate</td>
<td>5.14&lt;sub&gt;ab&lt;/sub&gt; (2.53)</td>
<td>6.37&lt;sub&gt;ab&lt;/sub&gt; (2.18)</td>
<td>5.17&lt;sub&gt;ab&lt;/sub&gt; (2.49)</td>
<td>4.03&lt;sub&gt;ab&lt;/sub&gt; (2.54)</td>
</tr>
<tr>
<td>High</td>
<td>4.10&lt;sub&gt;b&lt;/sub&gt; (1.79)</td>
<td>5.05&lt;sub&gt;b&lt;/sub&gt; (1.74)</td>
<td>4.59&lt;sub&gt;b&lt;/sub&gt; (1.52)</td>
<td>3.66&lt;sub&gt;b&lt;/sub&gt; (3.27)</td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly ($p>.05$).
Effect of prospect-refuge

As can be seen in Table 5.9, a number of significant main effects of prospect-refuge were found using a series of one way within-subjects ANOVAs. As expected, the low prospect-refuge conditions received significantly higher ratings of perceived danger (hypothesis 4) and fear (hypothesis 5) than the high prospect-refuge conditions. The low prospect-refuge conditions also received significantly lower ratings of perceived restoration (hypothesis 6) than the high prospect-refuge conditions.

Table 5.9.
Main effect results of prospect-refuge condition for the three main variables under investigation

<table>
<thead>
<tr>
<th></th>
<th>Low Prospect-Refuge</th>
<th>High Prospect-Refuge</th>
<th>ANOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived danger</td>
<td>4.32 (1.57)</td>
<td>2.46 (1.91)</td>
<td>$F(1, 95) = 31.02,$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$p&lt;.001, \eta^2 = .25$</td>
</tr>
<tr>
<td>Fear</td>
<td>3.76 (0.98)</td>
<td>2.40 (1.31)</td>
<td>$F(1, 95) = 41.42,$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$p&lt;.001, \eta^2 = .31$</td>
</tr>
<tr>
<td>Perceived restoration</td>
<td>4.14 (1.52)</td>
<td>6.07 (1.65)</td>
<td>$F(1, 95) = 93.45,$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$p&lt;.001, \eta^2 = .32$</td>
</tr>
</tbody>
</table>

As can be seen in Table 5.10, breaking down the SRRS into its four composite dimensions and comparing ratings between the two prospect-refuge conditions once again using one way within-subjects ANOVAs revealed significant results. For all four dimensions, the high prospect-refuge environment was perceived as more restorative than the low prospect-refuge environment.
Table 5.10.

*Dimensional perceived restoration ratings (standard deviation) between the two prospect-refuge conditions*

<table>
<thead>
<tr>
<th>Dimension of perceived restoration</th>
<th>Low Prospect-Refuge</th>
<th>High Prospect-Refuge</th>
<th>ANOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotional</td>
<td>3.90 (1.89)</td>
<td>6.24 (2.01)</td>
<td>$F(1, 95) = 45.12$, $p &lt; .001, \eta^2 = .32$</td>
</tr>
<tr>
<td>Cognitive</td>
<td>5.30 (2.24)</td>
<td>6.31 (1.77)</td>
<td>$F(1, 95) = 6.53$, $p &lt; .03, \eta^2 = .07$</td>
</tr>
<tr>
<td>Physiological</td>
<td>4.45 (1.89)</td>
<td>6.01 (2.01)</td>
<td>$F(1, 95) = 17.51$, $p &lt; .001, \eta^2 = .16$</td>
</tr>
<tr>
<td>Behavioural</td>
<td>2.91 (1.92)</td>
<td>5.70 (2.28)</td>
<td>$F(1, 95) = 50.82$, $p &lt; .001, \eta^2 = .35$</td>
</tr>
</tbody>
</table>

*Interaction effects*

Because two factors were manipulated (danger scenario and prospect-refuge), there was an opportunity for potential interaction effects that warrant examination using a two-way mixed ANOVA.

A significant interaction between danger scenario and prospect-refuge was found for perceived danger ratings ($F(2, 95) = 3.91, p < .03, \eta^2 = .08$) (see Fig. 5.5).
Fig. 5.5. Mean perceived danger ratings for the three danger scenarios as a function of prospect-refuge condition (Error bars: 95% CI)

Further examination of the interaction revealed that in both the no and moderate danger scenarios, the low prospect-refuge condition was perceived as significantly more dangerous than the high prospect-refuge condition (see Table 5.11). The difference was not significant in the high danger scenario. In the low prospect-refuge conditions, none of the comparisons of perceived danger ratings were significant. However in the high prospect-refuge conditions, the high danger scenario was perceived as significantly more dangerous than both the no and moderate danger scenarios.
Table 5.11.
Mean perceived danger rating (standard deviation) comparisons between danger scenarios for both prospect-refuge conditions

<table>
<thead>
<tr>
<th>Danger scenario</th>
<th>Low Prospect-Refuge</th>
<th>High Prospect-Refuge</th>
<th>Test of difference between prospect-refuge conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$M$</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>4.12&lt;sub&gt;a&lt;/sub&gt;</td>
<td>1.88&lt;sub&gt;a&lt;/sub&gt; (1.27)</td>
<td>$t(32) = 4.42, p &lt; .001, r = .61$</td>
</tr>
<tr>
<td>Moderate</td>
<td>4.81&lt;sub&gt;a&lt;/sub&gt;</td>
<td>2.00&lt;sub&gt;a&lt;/sub&gt; (1.97)</td>
<td>$t(32) = 4.80, p &lt; .001, r = .65$</td>
</tr>
<tr>
<td>High</td>
<td>4.06&lt;sub&gt;a&lt;/sub&gt;</td>
<td>3.47&lt;sub&gt;b&lt;/sub&gt; (2.07)</td>
<td>$t(32) = 0.90, p = .37, r = .15$</td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly ($p > .05$).

The interaction between danger scenario and prospect-refuge was also found to be significant for fear ratings ($F(2, 95) = 4.51, p < .03, \eta^2 = .09$) (see Fig. 5.6).

Fig. 5.6. Mean fear ratings for the three danger scenarios as a function of prospect-refuge condition. (Error bars: 95% CI)

A similar pattern emerged for fear, with both the no and moderate danger scenarios revealing significant differences between prospect-refuge conditions. In these
scenarios, the low prospect-refuge condition evoked significantly more fear than the high prospect-refuge condition (see Table 5.12). The difference was not significant in the high danger scenario. In the low prospect-refuge conditions, none of the comparisons of fear ratings were significant. However in the high prospect-refuge conditions, the high danger scenario evoked significantly more fear than both the no and moderate danger scenarios.

Table 5.12.
Mean fear rating (standard deviation) comparisons between danger scenarios for both prospect-refuge conditions

<table>
<thead>
<tr>
<th>Danger scenario</th>
<th>Low Prospect-Refuge</th>
<th>High Prospect-Refuge</th>
<th>Test of difference between prospect-refuge conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(M)</td>
<td>(M)</td>
<td>(t(26.82) = -6.38, p &lt; .001, r = .72)</td>
</tr>
<tr>
<td>No</td>
<td>3.59 (a)</td>
<td>1.76 (a)</td>
<td>(t(32) = -4.41, p &lt; .001, r = .66)</td>
</tr>
<tr>
<td>Moderate</td>
<td>3.88 (a)</td>
<td>2.06 (a)</td>
<td>(t(32) = -1.56, p = .13, r = .18)</td>
</tr>
<tr>
<td>High</td>
<td>3.82 (a)</td>
<td>3.35 (b)</td>
<td></td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly (\(p > .05\)).

The interaction between danger scenario and prospect-refuge for perceived restoration ratings was also significant \((F(2, 95) = 3.58, p < .05, \eta^2 = .07)\) (see Fig. 5.7).
Fig. 5.7. Mean perceived restoration ratings for the three danger scenarios as a function of prospect-refuge condition. (Error bars: 95% CI).

The analysis revealed significant differences in perceived restoration between prospect-refuge conditions for the no and moderate danger scenarios. In these scenarios, the low prospect-refuge condition was perceived as significantly less restorative than the high prospect-refuge condition (see Table 5.13). The difference was not significant in the high danger scenario. In the low prospect-refuge conditions, none of the comparisons of perceived restoration ratings were significant. However in the high prospect-refuge conditions, the high danger scenario was perceived as significantly less restorative than both the no and moderate danger scenarios.
Table 5.13. 
Mean perceived restoration rating (standard deviation) comparisons between danger scenarios for both prospect-refuge conditions

<table>
<thead>
<tr>
<th>Danger scenario</th>
<th>Low Prospect-Refuge M</th>
<th>High Prospect-Refuge M</th>
<th>Test of difference between prospect-refuge conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>4.50&lt;sub&gt;a&lt;/sub&gt; (1.26)</td>
<td>7.06&lt;sub&gt;a&lt;/sub&gt; (1.07)</td>
<td>t(32) = -6.38, p &lt; .001, r = -.74</td>
</tr>
<tr>
<td>Moderate</td>
<td>3.98&lt;sub&gt;a&lt;/sub&gt; (1.58)</td>
<td>6.38&lt;sub&gt;a&lt;/sub&gt; (1.49)</td>
<td>t(32) = -4.41, p &lt; .001, r = -.62</td>
</tr>
<tr>
<td>High</td>
<td>3.92&lt;sub&gt;a&lt;/sub&gt; (1.71)</td>
<td>4.76&lt;sub&gt;b&lt;/sub&gt; (1.47)</td>
<td>t(32) = -1.56, p = .13, r = -.25</td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly (p > .05).

The four dimensions of the SRRTS were also examined for potential interactions between danger scenario and prospect-refuge. No significant interaction was found for either perceived cognitive restoration ($F(2, 95) = 0.23, p = .80, \eta^2 = .01$) or perceived physiological restoration ($F(2, 95) = 2.09, p = .13, \eta^2 = .04$). However, significant interactions were found for perceived emotional restoration ($F(2, 95) = 4.29, p < .03, \eta^2 = .08$) (see Fig. 5.8) and perceived behavioural restoration ($F(2, 95) = 3.59, p < .03, \eta^2 = .07$) (see Fig. 5.9).
Fig. 5.8. Mean perceived emotional restoration ratings for the three danger scenarios as a function of prospect-refuge (Error bars 95% CI)

Fig. 5.9. Mean perceived behavioral restoration ratings for the three danger scenarios as a function of prospect-refuge (Error bars 95% CI)
Significant differences in perceived emotional restoration were found between the two prospect-refuge conditions for the no and moderate danger scenarios. In these scenarios, the low prospect-refuge condition was perceived as significantly less emotionally restorative than the high prospect-refuge condition (see Table 5.14). The difference was not significant in the high danger scenario. In the low prospect-refuge conditions, none of the comparisons of perceived emotional restoration ratings were significant. However in the high prospect-refuge conditions, the high danger scenario was perceived as significantly less emotionally restorative than both the no and moderate danger scenarios.

Table 5.14.

Mean perceived emotional restoration rating (standard deviation) comparisons between danger scenarios for both prospect-refuge conditions

<table>
<thead>
<tr>
<th>Danger scenario</th>
<th>Low Prospect-Refuge</th>
<th>High Prospect-Refuge</th>
<th>Test of difference between prospect-refuge conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>4.41 a (1.81)</td>
<td>7.53 a (0.87)</td>
<td>( t(23.00) = -6.39, p &lt; .001, r = -.74 )</td>
</tr>
<tr>
<td>Moderate</td>
<td>3.63 a (1.94)</td>
<td>6.66 a (2.14)</td>
<td>( t(32) = 4.80, p &lt; .001, r = -.60 )</td>
</tr>
<tr>
<td>High</td>
<td>3.65 a (1.95)</td>
<td>4.56 b (1.53)</td>
<td>( t(32) = 0.90, p = .37, r = -.25 )</td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly \((p > .05)\).

As can be seen in Table 5.15, very similar findings were found in relation to perceived behavioural restoration. However in the high prospect-refuge condition, despite the high danger scenario being perceived as significantly less behaviourally restorative than the no danger scenario, it was not significantly different to the moderate danger scenario.
Table 5.15.
Mean perceived behavioural restoration rating (standard deviation) comparisons between danger scenarios for both prospect-refuge conditions

<table>
<thead>
<tr>
<th>Danger scenario</th>
<th>Low Prospect-Refuge</th>
<th>High Prospect-Refuge</th>
<th>Test of difference between prospect-refuge conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>3.44 (_a) (2.00)</td>
<td>6.98 (_a) (1.67)</td>
<td>(t(32) = -5.58, p &lt; .001, d = -.69)</td>
</tr>
<tr>
<td>Moderate</td>
<td>2.25 (_a) (1.24)</td>
<td>5.81 (_{ab}) (2.26)</td>
<td>(t(25.23) = -5.52, p &lt; .001, d = -.70)</td>
</tr>
<tr>
<td>High</td>
<td>3.00 (_a) (2.27)</td>
<td>4.32 (_b) (2.15)</td>
<td>(t(32) = -1.75, p = .09, d = -.29)</td>
</tr>
</tbody>
</table>

Note: means with similar subscripts do not differ significantly \((p > .05)\).

5.4 DISCUSSION

The aim of this study was to examine the effect of manipulating the presence of a social danger on perceptions of danger, fear and restoration through two simulated walks in a country park that differed in levels of prospect-refuge.

The effect of danger scenario

The manipulation of social danger revealed some interesting results. Rather surprisingly no significant main effect of perceived danger was found, with none of the comparisons between danger scenarios found to be significant. Although the expected tendency for ratings of perceived danger to increase with levels of social danger was found, these results were not statistically significant. In particular, ratings of perceived danger in the high social danger scenario did not appear to be as high as expected and this may explain why no significant main effect was found. The reason behind this is unclear, but the interaction between danger scenario and prospect-refuge may shed some light on the possible causes for this non-significant result.

Despite the absence of a significant main effect for perceived danger, significant expected main effects of both fear and perceived restoration were found. Comparisons
revealed that for both fear and perceived restoration, the high danger scenario was significantly different to both the no and moderate danger scenarios. The differences between the no and moderate danger scenarios were not found to be significantly different for either fear or perceived restoration. Dissemination of the perceived restoration measure into its four composite dimensions also revealed a significant main effect of danger scenario. The presence of a high social danger was perceived as significantly less emotionally, cognitively, physiologically and behaviourally restorative than in the absence of an imagined social danger. However the differences in all four dimensions of perceived restoration between the moderate and high social danger scenarios were not found to be significant.

The finding that an imminent and severe social danger reduces the perceived restorative benefit of a walk through an environment supports recent work by Herzog and Rector (2009). It also supports findings discussed in previous chapters of this thesis that has demonstrated social danger to be a very fear-evoking type of danger that is perceived as being detrimental to restoration. The addition of the moderate danger scenario was useful because the results suggest that people perceive a distinct difference between being followed and having somebody walking behind them, whereby having somebody walk behind them is not perceived as any less restorative as if they were alone. Despite the absence of a significant main effect of danger scenario on the three items from the perceived danger measure, post-hocs revealed some significant differences that may help our understanding of the perceptual differences between the moderate and high social danger scenarios. The high social danger scenarios were perceived as having a greater likelihood of coming to harm from another person and also as having more severe consequences than the other danger scenarios. These results suggest that having someone walking behind a person does not result in any greater perceived likelihood of falling victim to a social danger than if nobody else is about. It would be interesting for future research to try to explore the perceptual differences between somebody ‘walking behind’ and ‘following’ an individual further, and also at what point a moderate danger become a high danger. This is because as these results show, a high social danger scenario can really degrade the experience of walking
through a natural environment such as a country park whereas a moderate social danger scenario does not.

*The effect of prospect-refuge*

The physical structure of the country park was once again manipulated using Fisher and Nasar’s (1992) typology of prospect-refuge. Significant expected main effects of perceived danger, fear and perceived restoration were found. The simulated walk with low levels of prospect-refuge was perceived as significantly more dangerous and fear-evoking, but significantly less restorative than the walk with high levels of prospect-refuge. The same effect was also found for all four dimensions of perceived restoration. This supports the work of previous studies that has successfully applied the typology to explain variations in perceptions of danger, safety and fear within largely urban environments (e.g. Fisher & Nasar, 1992; Nasar & Jones, 1997; Petherick, 2000/2001; Wang & Taylor, 2006). The results also build on the work of previous chapters by showing that variations in prospect-refuge according to the typology can result in significantly different perceptions of danger, fear and restoration within a natural environment such as a country park. However this study focused exclusively on manipulating social danger. Previous chapters have found that perceptions of the likelihood of encountering a social danger do not appear do vary with prospect-refuge. In response to a specific social danger threat, low and high prospect-refuge environments have also been found to be perceived as equally dangerous, preferred and restorative. So why are the results of this chapter so different to those from the two preceding chapters? It is possible that because this chapter used a more immersive simulation technique, it was able to find significant differences that the other chapters were unable to find. However it is worth considering that the main effect of prospect-refuge on the dependent variables may be masked by the three types of danger scenario. The previous chapter demonstrated that in the absence of any specific threat, a simulated walk through a high prospect-refuge country park is perceived as less dangerous or fear-evoking but more restorative than a simulated walk through a low prospect-refuge country park. Furthermore the results of this study suggest that the moderate social
danger scenario was perceived more similarly to the no danger control condition than the high social danger scenario. Based on the findings of the previous chapters, one could expect that both the no and moderate social danger scenarios would find significant differences between prospect-refuge conditions. The magnitude of these differences may contribute to a main effect being found, even if there were no significant differences between prospect-refuge conditions in the high social danger scenario. Exploration of the significant interactions found support this idea.

*Interactions*

Significant interactions between social danger scenario and prospect-refuge were found for perceived danger, fear and perceived restoration. Significant interactions between the two factors were also found for perceived emotional and behavioural restoration. In the low prospect-refuge conditions, all three social danger scenarios were perceived as equally dangerous, fear-evoking and restorative. In the high prospect-refuge conditions, the results found that both the no and moderate social danger scenarios were also perceived as equally dangerous, fear-evoking and restorative. However the high social danger scenario in the high prospect-refuge condition generated markedly less positive perceptions resulting in it being perceived as far more dangerous, fear-evoking and less restorative than the other two social danger scenarios in high prospect-refuge conditions. As a result, although the low prospect-refuge conditions were perceived as significantly more dangerous, fear-evoking and less restorative than the high prospect-refuge conditions for the no and moderate social danger scenarios, this was not the case for the high social danger scenario. Here no significant differences were found between the two prospect-refuge conditions for perceived danger, fear or perceived restoration. So what possible explanations can be put forward to explain why Fisher and Nasar’s (1992) typology of prospect-refuge appears unsuccessful in generating significant expected differences in perceived danger, fear and perceived restoration in the absence of a severe social danger where an individual is explicitly being followed? It is possible that within a low prospect-refuge environment, people expect the worst in terms of danger and so the manipulation of social danger has no
discernable effect. Conversely in a high prospect-refuge environment, people may expect it to be safe and so the presence of an imminent and severe social danger may come as a rather unpleasant surprise. As a result, this may result in the danger having a greater effect than if the environment was more conducive to social danger and an individual felt there was a distinct possibility of being attacked. This explanation may also explain why no significant main effect of social danger scenario was found for perceived danger ratings.

The results of this study may have important implications regarding the possible use of Fisher and Nasar's (1992) typology of prospect-refuge in natural environments such as country parks. In the absence of an imminent social danger, a higher prospect-refuge environment is perceived as less dangerous or fear-evoking and more restorative than a low prospect-refuge environment. This also holds true in the presence of a moderate social danger where a stranger is walking behind an individual. Therefore within these contexts, Fisher and Nasar's (1992) typology appears to be one way of ensuring that an environment is perceived as safe and protecting its perceived restorative value. However in the presence of an imminent and severe social danger such as being followed, these results suggest that manipulating the physical structure of a natural environment such as a country park according to the typology will not result in significantly different perceptions of danger, fear or restoration. Therefore instead of focusing on using the physical structure of the environment to combat the effects of these dangers, efforts should be focused on preventing the occurrence of such dangers as this is likely to protect the perceived restorative value of an environment better.

5.5 THE NEXT STEP FOR THIS THESIS

The study described in this chapter has followed on from the previous ones by using a quantitative methodology to examine the effect of a specific danger on perceptions made when taking a simulated walk through a country park. The methodology chosen to explore this research area raises two pertinent questions. Firstly, how realistic and valid is a simulation method in measuring these perceptions? Although ethical restraints mean that the manipulation of danger has to be done within a simulated
laboratory experiment, it is important that the methodology adopted has ecological validity. The second question raised also relates to the methodology chosen, is the SRRS measure of perceived restoration truly indicative of actual restoration? These questions need addressing before firm conclusions can be drawn regarding the practical implications and generalisability of this research.
CHAPTER 6

ACTUAL RESTORATION IN FIELD AND SIMULATED WALKS THROUGH NATURE: THE EFFECT OF PROSPECT-REFUGE

6.1 INTRODUCTION

The preceding research studies in this thesis have all used an experimental design to measure perceived restoration using a simulation technique. The findings in relation to perceived restoration are important because the perceptions of the restorative benefits that one could experience may be an important factor in the decision to visit an environment or not. But how accurate are these perceptions? Existing research comparing natural and urban environments have demonstrated a high level of congruence between studies of perceived and actual restoration, suggesting that people can intuitively perceive the restorative benefits that an environment may provide. However the effect of prospect-refuge on actual restoration and in real-life natural environments is something that has not really been explored by existing research and may provide a further test of the roles of prospect, refuge and accessibility on restoration within a natural environment. It also provides an opportunity for comparisons to be made following exposure to simulated or real natural environments. This is important because simulated environments may not provide the same level of restoration as a real environment because senses such as touch and smell are lacking. However quantifying the extent to which restoration from a simulated environment differs from a real environment is something that has been largely ignored by existing research. Therefore the aim of this study is to build on the findings of the previous ones by testing Fisher and Nasar’s (1992) typology of prospect-refuge measuring actual restoration in both simulated and real-life natural environments.
Simulated versus field experiments

The use of simulation techniques in the previous research chapters has been one way of overcoming the ethical constraints of manipulating different types of danger and threat within a natural environment. The effect of danger threat in natural environments on positive experiences such as preference and perceived restoration is something that has been largely ignored by existing research. Therefore the tighter experimental control of the simulation technique and relative ease of collecting larger samples means that it should be considered a valuable way of exploring a relatively new research area.

Studies that expose people to simulated environments (e.g. Hartig et al., 1996; Staats & Hartig, 2004; Ulrich et al., 1991) and experiencing the environment in person (e.g. Hartig et al., 1991; Hartig et al., 2003; Kaplan & Kaplan, 1989; Marselle, 2004) have all demonstrated a tendency for contact with nature to result in emotional, attentional and physiological restoration. Although the high level of congruence in findings between simulation and field experiments means that the simulation technique has become a largely acceptable method of investigating restorative experiences, there are some limitations with such a technique. Simulations restrict people to only experiencing visual characteristics whilst other aspects that may be considered integral to the restorative experience such as smell and touch are lacking. Of the main simulation techniques used, Heft and Nasar (2000), claim that the use of videotape is better than the use of a series of pictures as they allow opportunities for random stop points so that respondents may make specific judgements. Regardless of the technique used, simulation techniques make it difficult to capture an intrinsic motivation in an experimental setting (S. Kaplan, 2001). Such a motivation is an important factor in real-life restorative experiences because it reduces the ‘costs’ of dealing with demanding situations. Instead experimental settings typically offer an extrinsic reward in the form of monetary rewards and as a result, the intrinsic motivational aspect of restorative experiences is absent. These limitations would lead one to expect that the use of simulations would only make it harder to detect any real effects. It is therefore possible that significant effects could be missed by employing a simulation technique. For example, a recent study by Mayer, McPherson Frantz, Bruehlman-Senecal and Dolliver
(2009) demonstrated that both actual and simulated exposure to nature resulted in more positive emotions, increased attentional capacity and a heightened ability to reflect on a life problem. However the effects were more dramatic for actual than simulated nature. This supports the idea that a simulated environment may not afford the full restorative benefits of the environment it represents. Therefore to fully understand the effects of prospect-refuge on restoration, it makes sense to explore the effects in real-life settings.

*Effect of PR*

Fisher and Nasar’s (1992) typology of prospect-refuge was once again used as a way of manipulating the physical structure of the environment. Based on Appleton’s (1975) prospect-refuge theory, the typology attempts to explain an individual’s perceptions of an environment based on the levels of prospect, refuge and accessibility. Urban environments that are low in prospect, contain a high level of refuge for a potential offender to hide and offer an impeded escape for a potential victim are perceived as less safe, evoke a higher fear of crime and are less preferred than environments high in prospect, that contain a low level of refuge for a potential offender and offer a quick escape for a potential victim (e.g. Fisher & Nasar, 1992; Nasar & Jones, 1997; Petherick, 2000/2001; Wang & Taylor, 2006). The previous research chapters have demonstrated that on the whole, lower prospect-refuge natural environments are more fear-evoking and perceived as less restorative than their higher prospect-refuge counterparts. In addition to this, explicit relationships were stated in the first research chapter between preference and perceived restoration (positive), and preference and fear (negative). Existing research has demonstrated a high level of congruence between studies using perceived restoration with actual restoration. The theoretical grounding of Han’s (2003) SRRS in conjunction with the high convergent validity it shares with other established measures of perceived restoration such as the PRS (Hartig et al. 1997a) would suggest that we can reasonably expect prospect-refuge to affect actual restoration in the same way it affects perceived restoration.

However the previous research chapters in this thesis have solely used a simulation method. This raises an interesting question – could the effect of prospect-
refuge differ between laboratory and field settings? Given that simulations restrict senses such as smell and touch, one could expect that an actual walk through a pleasant high prospect-refuge will be more restorative than a simulated walk through it. Conversely, a simulated walk through a low prospect-refuge environment could be more restorative than an actual walk through the environment because it is not as real and does not actually expose participants to any real danger. Existing research in urban environments using Fishers and Nasar’s (1992) typology suggest that a low prospect-refuge environment is perceived more negatively than a high prospect-refuge environment (e.g. Fisher & Nasar, 1992; Nasar & Jones, 1997; Petherick, 2000/2001; Wang & Taylor, 2006). The previous research chapters have also demonstrated similar findings within natural environments, with a simulated walk through low levels of prospect-refuge being perceived as more dangerous and fear-evoking than a simulated walk through a high prospect-refuge natural environment. There appears a distinct possibility that fear ratings could be significantly higher when taking an actual walk as opposed to a simulated walk within a low prospect-refuge environment. Based on the relationships between fear and perceived restoration found in the first research chapter, one would expect this higher level of fear to result in lower levels of restoration. However because there is no active manipulation of danger and the ratings of fear in natural environments taken in the previous research chapters have tended to be towards the lower end of the scales used to measure them, the researcher feels the low prospect-refuge environment is still likely to be partially restorative. Therefore he feels it is more likely that the actual environments will be more restorative than the laboratory conditions in the low and certainly the high prospect-refuge environments.

Hypotheses

Using established measures of actual restoration, this study compared fear ratings and the restorative effects of two walks that differed in prospect-refuge in both a simulated laboratory setting and a field setting. The previous research chapters have stated relationships and consistently demonstrated that a simulated walk through a high prospect-refuge environment is less fear-evoking and perceived as more restorative than
a low prospect-refuge environment. These studies used Han’s (2003) SRRS to measure perceived restoration. The scale consists of four perceived dimensions: emotional, cognitive, physiological and behavioural. Consistent with this, established objective measures of actual restoration for each of the four dimensions were selected for use in this study (see Method for details), leading to the following hypotheses being made:

Emotional restoration (as measured by the ZIPERS) is expected to be significantly greater for those walking through the high prospect-refuge environment than the low prospect-refuge environment (hypotheses 1). Emotional restoration is also expected to be significantly greater for those taking the field condition walks rather than the simulated laboratory counterparts (hypotheses 2).

Cognitive restoration (as measured by the NCPT) is expected to be significantly greater for those walking through the high prospect-refuge environment than the low prospect-refuge environment (hypothesis 3). Cognitive restoration is also expected to be significantly greater for those taking the field condition walks rather than the simulated laboratory counterparts (hypothesis 4).

Physiological restoration (as measured by reduction in heart rate) is expected to be significantly greater for those walking through the high prospect-refuge environment than the low prospect-refuge environment (hypothesis 5). Physiological restoration is also expected to be significantly greater for those taking the field condition walks rather than the simulated laboratory counterparts (hypothesis 6).

Behavioural restoration (as measured by walk duration) is expected to be significantly greater for those walking through the high prospect-refuge environment than the low prospect-refuge environment (hypothesis 7). Behavioural restoration is also expected to be significantly greater for those taking the field condition walks rather than the simulated laboratory counterparts (hypothesis 8).
6.2 METHOD

Respondents and Design

Seventeen participants consisting of undergraduate and postgraduate students from the University of Surrey Human Sciences department were recruited for the field condition sample of the study (10 female; \( M = 23.18 \) years, \( SD = 8.23 \) years; 18-43 years). Participants made two separate walks through a country park that differed according to Fisher and Nasar’s (1992) typology (low, high). The order in which the participants took the walks was counterbalanced to prevent order effects. This sample was combined with part of a sample taken 3 months later that had viewed video recordings of the same two walks (laboratory condition). This sample also consisted of seventeen undergraduate and postgraduate students from the University of Surrey Human Sciences department (10 female; \( M = 20.88 \) years, \( SD = 5.02 \) years; 18-38 years). Both samples participated in the study in exchange for course credits. The two samples formed a mixed model design where both samples had one within-subject factor (low vs. high prospect-refuge walk) and one between-subject factor (field vs. simulation). The two samples did not differ significantly in age \( (U = 133.50, p = .91) \), gender \( (U = 133.00, p = .91) \) or previous experience of visiting country parks \( (U = 488.50, p = .45) \).

Fatigue task

To ensure participants were in a state conducive to restoration, they were asked to complete a computer-based fatigue task. The task was the same amended Stroop task as the one described in the previous chapter, created using E-Prime 2.0 that used both colours and shapes. A previous pilot test found the task to be successful in inducing a cognitively depleted and negative emotional state. Participants took a seat in front of a PC with a 19 inch monitor and were presented with individual trials where a coloured shape (triangle, square, rhombus, pentagon and hexagon in red, blue, black, white, yellow or green) appeared in the centre of the screen. At the same time, a word
describing either a colour or shape appeared at the top of the screen. Participants had to indicate whether or not the word was related to the coloured shape by pressing the ‘y’ key if it was related and the ‘n’ key if it was not related. The word was deemed to be related if it accurately described either the shape or the colour of the coloured shape that was presented in the middle of the screen. For example, if a red triangle was presented and the word ‘red’ or ‘triangle’ appeared above it, it was deemed to be related, whilst if the word ‘green’ or ‘square’ appeared, it was deemed to be unrelated. After each response, a new trial began which was randomly selected by the computer. This continued for five minutes. In an attempt to get participants to really concentrate on the task, they were instructed that they would be scored on how quickly and how accurately they responded. During the task, participants were also given a set of headphones playing building construction sounds in an attempt to distract them from the task, thus placing an even higher demand on attentional capacity.

*Environmental stimuli*

Two walks through areas of The Queen Elizabeth Country Park near Portsmouth, England were chosen and used in the study. The park contains a diverse range of habitats from calcareous grassland and yew woodland to coniferous and beech plantations spread over more than 1400 acres that can be explored by walkers, cyclists and horse riders. Following extensive exploration of the country park by the researcher, two walks were chosen that differed according to Fisher and Nasar's (1992) typology of prospect-refuge. The low prospect-refuge walk was characterized by low levels of prospect and accessibility but a high number of potential hiding places, whereas the high prospect-refuge walk was characterized by high levels of prospect and accessibility but a low number of potential hiding places. To ensure participants followed the same walks, both walks were actual walks that followed paths through the environment. However the paths on the high prospect-refuge walk were a great deal more open, clear of obstacles and with a further line of sight than the low prospect-refuge walk. Participants in the field condition were not given maps as it was felt this may distract them from the walk but instead, coloured discs with arrows were placed on the paths were the walk’s
direction changed or was uncertain. At the end of the experiment, these participants were asked if they lost their way on the walk or encountered any other people in either of the walks they had taken. No participants reported losing their way whilst two participants reported seeing another person during their walk. One participant encountered another individual in the low prospect-refuge condition whilst the other encountered a small group of people in the high prospect-refuge condition. The field condition was completed by all participants across three sunny days in early July.

The same two walks were used in the laboratory condition and were recorded two days prior to the field condition being completed and served as the environmental stimuli in the previous chapter. They were recorded from a first person perspective using a Samsung DV381 videocamera. The recordings also included an audio recording from the background noise from the walk. The walks were recorded in one minute segments consisting of a 45 second walking element followed by a 15 second pause and 360 degree panoramic scan before continuing into the next segment. Both videos lasted for a total of ten minutes and no people were visible or audible in either of the videos. The simulation sample saw the videos of the two walks projected onto a white-washed laboratory wall using a Sony VPL-EPX5+ digital projector. The projections were fairly immersive and were projected to a size of 307cm x 230cm whilst the audio recordings were played using the integrated speakers.

Before viewing each video of the walk, participants in the laboratory condition read a short description instructing them to imagine that they were making the walk for real whilst also making indirect reference to levels of prospect, accessibility and hiding places in the walk they were about to see. This was done by describing physical features such as light, vegetation, obstructions and pathways of the environment (see vignettes 1 and 4 in Appendix C). It was felt that this would help reinforce the physical structure of the environment they were going to see in the video and help them better imagine walking through it. Participants in the field condition were not given any description of the environment.
Measures

Emotional restoration was measured using Zuckerman’s (1977) Inventory of Personal Reactions (ZIPERS). The ZIPERS is a short 12 item measure that consists of five factors: positive affect, attentiveness, fear arousal (fear), sadness, and anger/aggression (anger). In this study, respondents were asked to indicate the extent to which statements describe how they felt at the end of each walk on a five-point likert scale (e.g. I feel elated or pleased) (1 = not at all; 5 = very much). The scores used in this analysis are the mean ratings for each of the five ZIPERS factors. The ZIPERS has been a sensitive measure of emotional restoration in a number of previous restorative environment studies (e.g. Hartig et al., 1991, 1996, 2003; Korpela & Hartig, 1996; Ulrich et al., 1991). Higher emotional restoration is characterized by more positive mood states (high positive affect and attentiveness but low fear arousal, sadness and anger).

Cognitive restoration was measured using the Necker Cube Pattern Control task (NCPCT). The NCPT has been a sensitive and successful measure of attention in previous restoration literature (e.g. Hartig et al., 2003; Tennessen & Cimprich, 1995). Respondents are presented with a blank sheet containing a line drawing of a three-dimensional cube. They are then told that their perspective on the cube will shift, with the front and back faces of the cube reversing their relative positions. Once familiarized with this property of the Necker cube, respondents are instructed to look at the cube and tap audibly on a hard surface each time the pattern reversed. The total number of reversals occurring during two consecutive 30 second “hold” periods are counted. During each period, the respondent is asked to focus on one pattern for as long as possible. Kaplan (1995) states that reversals that occur despite the effort to hold a pattern are a result of attentional fatigue. The average number of reversals occurring across the two hold periods was taken as the dependent variable in the analyses with lower scores indicating greater cognitive restoration (cf. Tennessen & Cimprich, 1995).

Physiological restoration was measured by heart rate (pulse) represented in beats per minute. The measurement of heart rate has become a common measure of physiologically restoration within the literature (e.g. de Kort et al., 2006; Hartig et al., 2003; Laumann et al., 2003; Parsons et al., 1998; Ulrich et al., 1991). Similar to the
design of this study, these existing studies have typically increased heart rate by evoking fear or stress immediately before exposure to an environment to elicit a physiological state where stress recovery/physiological restoration is needed. Greater reductions in heart rate are interpreted to mean that an environment is more physiologically restorative.

Heart rate was measured using an A&D UA-767 digital blood pressure and heart rate monitor. The monitor uses an oscillometric method to measure heart rate and is accurate to within 2%. Although the monitor also measures blood pressure, only heart rate was measured in this analysis. There are so many exogenous variables that can cause blood pressure fluctuations such as time of day, recent caffeine intake and hormone levels. As a result, it was not deemed to be a reliable enough measure.

The cuff was wrapped around the participant’s upper left arm, around 2-3cm above the elbow. The cuff was placed directly against the skin to prevent clothing from causing a measurement error. Constriction of the upper arm caused by rolling up shirt sleeves was also prevented as this may have also impeded accurate readings. To take a measurement, the researcher pressed the start button on the monitor. The cuff then inflated to 150mmHg before a heart rate measurement was calculated in addition to a blood pressure measurement as the automatic exhaust mechanism gradually reduced the pressure in the cuff. Each time a measurement was taken, participants were seated with their arm resting upon a table in front of them. They were instructed to remain still and quiet during the measurement.

*Behavioural restoration* required an objective measure of approach or avoidance behaviour to be developed. Both SRT and ART include some form of behavioural element whereby a more restorative environment is approached and explored. Mehrabian and Russell (1974) claim that approach behaviour is characterised by seeking out, exploring and staying within an environment. With this in mind, the total duration of the walk for each participant was chosen to measure behavioural restoration. Within the field condition, participants were told they could walk at any speed they wanted, pause and look round providing they kept to the walk they were taking. To measure walk duration in the laboratory condition, a system was developed which allowed participants to alter the speed of the walk they were shown in the videos using a
handheld switch. They were instructed that they control the speed of the walk to suit their preferences and could change it as often as they wanted. By turning the switch once to the right, the playback speed of the video was increased by 25% from the original speed. By turning the switch a second turn to the right, the playback speed was increased by 50% from the original speed. By turning the switch to the left, the playback speed decreased by the same amount. A total of 5 speeds were available and all videos started on the default middle speed which was the same speed the walk was recorded at. The overall behavioural restoration score was the duration the video of the walk lasted for with longer durations deemed to be indicative of greater behavioural restoration. If the speed of the walk was left unchanged, both videos lasted for 10 minutes. In their study, van den Berg et al. (2003) used videos of walks through urban and natural environments that lasted for seven minutes. The videos were successful in inducing changes in emotion but only marginally significant changes in cognition. It was posited that a longer duration video may have resulted in significant changes in cognition. To provide a chance of finding these effects on cognition, the duration of the walks (both actual and standardised duration of the videos) were chosen to be longer (10 minutes).

No manipulation checks of prospect-refuge were included as these were the same videos of walks used in the previous study. A pilot test conducted prior to carrying out the previous study demonstrated significant expected differences in prospect, hiding places and accessibility. However one item was used to ensure there were no significant differences in previous experience of visiting country parks between the laboratory and field conditions: “How often do you visit country parks?” The response options ranged from 1 (not at all often) to 7 (very often).

Procedure

Participants in both the laboratory and field conditions first had the heart rate monitor attached to their arm before a reading was taken to ensure the monitor was working correctly. Participants were then asked to complete the PC-administered fatigue task. Upon completion of the task, another reading was taken from the heart rate monitor before participants were asked to complete the ZIPERS and NCPT. Those in the
laboratory condition were then given the short description of the walk to read before taking a seat that was positioned 400cm from and directly facing the laboratory wall on which the video was to be projected. Participants were instructed that they could control the speed of the walk so that it was at a pace that felt comfortable to them. During the video of the walks, the laboratory lights were switched off to aid the clarity of the projection and the order of the walks was randomised to prevent order effects. Immediately after the video had finished, the duration of the video was recorded and a reading from the heart rate monitor was taken again. Participants then completed the NCPT, ZIPERS and manipulation check item. The order in which these items were completed was randomised to prevent order effects. Participants were then taken to a nearby common room and given ten minutes to relax, read magazines and have a hot drink. They were then asked back into the laboratory and to complete the whole process from the attention fatigue task for a second time. However this time, participants read the description of the walk and viewed the video of the walk they had not previously seen.

For those in the field condition, a park office served as a laboratory for the task. Following the fatigue task, initial heart rate monitor check, ZIPERS and NCPT, participants were given instructions regarding the two walks. This included emphasising the need to follow the discs that had been placed along the route and to take note of whether they encountered any other people or animals on the walk. The order in which participants took the walks was randomly assigned to prevent order effects. A reading from the heart rate monitor was then taken immediately before participants started the walk. Both walks started and finished within 25 metres of the park office that was used to administer the fatigue task. The researcher waited for participants at the end of the walk where a final reading from the heart rate monitor was taken and the time taken for the walk recorded. Participants were then led back into the park office where they completed the NCPT, ZIPERS and manipulation check item. Once again, the order in which these were completed was randomised to prevent order effects. Participants were then taken to the nearby park visitor centre and given ten minutes to relax, read magazines and have a hot drink. They were then taken back to the park office to
complete the whole process again but taking the other walk. For both laboratory and field conditions, the whole process took around 50 minutes.

6.3 RESULTS

*Emotional restoration*

Emotional restoration, as measured by the ZIPERS, consisted of five distinct dimensions with greater positive changes in mood states (the difference between pre and post-walk scores) taken as indicating greater emotional restoration. A two way mixed ANOVA was conducted with prospect-refuge (within-subject factor) and walk type (between-subject factor) as the two independent factors for each of the five ZIPERS dimensions. This explored the main effects of each factor independently and the potential interaction between them.

In support of hypothesis 1, the restoration of positive affect was significantly greater following the walks through the high prospect-refuge environments ($M = 2.50$) than the low prospect-refuge environments ($M = 1.36$; $F (1, 66) = 47.78, p < .001, d = 1.72$). However contrary to hypothesis 2, the field condition walks ($M = 1.53$) were surprisingly found to be significantly less restorative of PA than the simulated laboratory walks ($M = 2.33$; $F (1, 66) = 7.76, p < .01, d = 0.68$). The interaction between prospect-refuge and walk type was not found to be significant ($F (1, 66) = 1.58, p = .21$). Fig. 6.1 displays the changes in positive affect ratings between the different conditions.
Fig. 6.1. Changes in positive affect ratings as a function of prospect-refuge and walk type.

The slight restoration of sadness was also significantly greater following the walk through the high prospect-refuge environments ($M = -0.03$) than the low prospect-refuge environments which actually experienced an increase in sadness ratings ($M = 1.04$; $F(1, 66) = 26.84$, $p < .001$, $d = 1.27$). Contrary to expectations, neither the field condition walks ($M = 0.37$) or simulated laboratory walks ($M = 0.62$) actually reduced sadness ratings. The change in sadness ratings was not found to be significantly different between the field condition walks and the simulated laboratory walks ($F(1, 66) = 1.35$, $p = .25$, $d = 0.28$). However prospect-refuge and walk type were found to significantly interact ($F(1, 66) = 10.66$, $p < .001$). The observed means suggest that only the participants exposed to the high prospect-refuge field walk experienced any reduction of sadness ratings, while participants exposed to the low prospect-refuge walks actually demonstrated an increase in sadness ratings (see Fig. 6.2). Tukey HSD post-hocs support this, with a significant pre to post-walk reduction in sadness ratings for those in the high prospect-refuge field walk. The pre to post-walk increase in sadness ratings for those exposed to the low prospect-refuge environments were also found to be significant for both field and laboratory conditions (all $p$'s < .03).
Fig. 6.2. Changes in sadness ratings as a function of prospect-refuge and walk type.

As expected, the restoration of attentiveness was significantly greater following the walk through the high prospect-refuge environments ($M = 1.00$) than the low prospect-refuge environments which actually recorded a reduction in attentiveness ratings ($M = -0.22$; $F(1, 66) = 59.22$, $p < .001$, $d = 1.92$). Despite attentiveness ratings increasing from pre-walk to post-walk in both the field condition walks ($M = 0.46$) and the simulated laboratory walks ($M = 0.33$), the difference between the two was not significant ($F(1, 66) = 0.72$, $p = .40$, $d = 0.21$). However the interaction between prospect-refuge and walk type was found to be significant ($F(1, 66) = 12.07$, $p < .001$). The observed means suggest that both field and laboratory participants exposed to the high prospect-refuge walks experienced an improvement in attentiveness, while participants exposed to the low prospect-refuge walks experienced no discernable change (see Fig. 6.3). Tukey HSD post-hocs support this, with a significant pre to post-walk increase in attentiveness ratings for those taking the high prospect-refuge walks ($p's < .01$). No significant change in attentiveness ratings were recorded for those exposed to the low prospect-refuge walks ($p's > .05$).
Fig. 6.3. Changes in attentiveness ratings as a function of prospect-refuge and walk type.

In terms of fear arousal ratings, participants exposed to the high prospect-refuge walks experienced a reduction from pre-walk to post-walk ($M = -0.52$) while those exposed to the low prospect-refuge walks actually experienced a slight increase in fear arousal ratings ($M = 0.25$). The difference between the two prospect-refuge walks was found to be significant ($F(1, 66) = 23.72, p < .001, d = 1.18$). However, contrary to expectations, the difference in the reduction in fear arousal ratings from pre-walk to post-walk in both the field condition walks ($M = -0.74$) and the simulated laboratory walks ($M = -0.67$) was not significant ($F(1, 66) = 0.66, p = .22, d = 0.11$). Once again, the interaction between prospect-refuge and walk type was found to be significant ($F(1, 66) = 5.97, p < .03$). The observed means suggest that both field and laboratory participants exposed to the high prospect-refuge walks experienced a reduction in fear arousal, while participants exposed to the low prospect-refuge walks experienced an increase, particularly those taking the actual field walk (see Fig. 6.4). Tukey HSD post-hocs support this, with a significant pre to post-walk decrease in fear arousal ratings for those taking the high prospect-refuge walks ($p’s < .001$). The increase in fear arousal ratings were only found to be significant for those exposed to the actual field low prospect-refuge walk ($p < .001$).
Fig. 6.4. Changes in fear arousal ratings as a function of prospect-refuge and walk type.

In terms of anger/aggression ratings, participants exposed to the high prospect-refuge walks experienced an expected reduction from pre-walk to post-walk ($M = -1.16$) while those exposed to the low prospect-refuge walks actually reported a slight increase in anger/aggression ratings ($M = 0.25$). The difference in change between the two prospect-refuge walks was found to be significant ($F(1, 66) = 56.72, p < .001, d = 1.94$). As expected, participants taking the field condition walks reported a significantly greater reduction in anger/aggression ratings from pre-walk to post-walk ($M = -1.27$) than participants exposed to the simulated laboratory walks ($M = 0.25; F(1, 66) = 19.32, p < .001, d = 1.07$). Once again the interaction between prospect-refuge and walk type was also found to be significant ($F(1, 66) = 4.88, p < .03$). The observed means suggest that both field and laboratory participants exposed to the high prospect-refuge walks experienced a reduction in anger/aggression, while participants exposed to the low prospect-refuge walks experienced a slight increase, more so for those taking the actual field walk (see Fig. 6.5). Tukey HSD post-hocs support this, with equally significant pre-to post-walk decreases in anger/aggression ratings for those taking the high prospect-refuge walks ($p's < .001$). The increase in anger/aggression ratings were not found to be significant for either low prospect-refuge walk ($p's > .05$).
Fig. 6.5. Changes in anger/aggression ratings as a function of prospect-refuge and walk walk type.

Cognitive restoration

Cognitive restoration was measured as the difference between pre and post-walk NCPT scores, with a greater reduction indicating greater cognitive restoration. A two way mixed ANOVA was conducted with prospect-refuge (within-subject factor) and walk type (between-subject factor) as the two independent factors with the difference between pre and post-walk NCPT scores as the dependent variable. This explored the main effects of each factor independently and the potential interaction between them.

In support of hypothesis 3, cognitive restoration was significantly greater following the walk through the high prospect-refuge environments with a reduction in NCPT scores ($M = -0.42$) than the low prospect-refuge environments which actually received an increase in NCPT scores ($M = 0.61$; $F(1, 66) = 8.74, p<.01, d = 4.79$). Supporting hypothesis 4, the field condition walks ($M = -0.10$) were also found to be significantly more cognitively restorative than the simulated laboratory walks ($M = 0.28$; $F(1, 66) = 52.85, p<.001, d = 1.77$). Prospect-refuge and walk type were also found to significantly interact ($F(1, 66) = 9.15, p<.01$). The observed means suggest that only the participants exposed to the high prospect-refuge field walk experienced any meaningful
cognitive restoration, while participants exposed to the low prospect-refuge walks actually demonstrated an increase in mental fatigue (see Fig. 6.6). Tukey HSD post-hocs support this, with pre to post-walk reductions in NCPT scores in the high prospect-refuge field condition being significantly greater than the other three conditions (all $p$'s < .01).

![Figure 6.6](image)

*Fig. 6.6. Change in NCPT scores as a function of prospect-refuge and walk type.*

*Physiological restoration*

Physiological restoration was measured as the difference between pre and post-heart rate, with greater reductions taken as indicating greater emotional restoration. A two way mixed ANOVA was conducted with prospect-refuge (within-subject factor) and walk type (between-subject factor) as the two independent factors and heart rate change as the dependent variable. This explored the main effects of each factor independently and the potential interaction between them.

In support of Hypothesis 5, physiological restoration (characterised by greater reductions in heart rate) was significantly greater following the walk through the high prospect-refuge environments ($M = 8.33$) than the low prospect-refuge environments ($M = 3.43$; $F (1, 66) = 12.83, p < .001, d = 0.88$). Hypothesis 6 was also supported, with the field condition walks ($M = 8.26$) being significantly more physiologically restorative.
than the simulated laboratory walks ($M = 3.00$; $F (1, 66) = 15.02$, $p < .001$, $d = 0.94$). Prospect-refuge and walk type were also found to significantly interact ($F (1, 66) = 4.14$, $p < .05$). The observed means suggest that the field condition participants experienced greater physiological restoration than the simulation participants but only in the high prospect-refuge environment (see Fig. 6.7). Tukey HSD post-hocs support this, with pre to post-walk reductions in heart rate in the high prospect-refuge field condition being significantly greater than the other three conditions (all $p$'s < .01).

![Graph showing heart rate changes](image)

**Fig. 6.7.** Change in heart rate as a function of prospect-refuge and walk type.

**Behavioural Restoration**

Behavioural restoration was measured using walk duration (in seconds), with longer walks taken as indicating greater behavioural restoration. A two way mixed ANOVA was conducted with prospect-refuge (within-subject factor) and walk type (between-subject factor) as the two independent factors and walk duration as the dependent variable. This explored the main effects of each factor independently and the potential interaction between them.

In support of Hypothesis 7, behavioural restoration (characterised by walk duration) was significantly greater following the walk through the high prospect-refuge environments ($M = 651s$) than the low prospect-refuge environments ($M = 499s$; $F (1,$
66) = 27.47, \( p < .001, d = 1.27 \). Hypothesis 8 failed to be supported, with the field condition walks (\( M = 600s \)) only being marginally significantly more behaviorally restorative than the simulated laboratory walks (\( M = 549s; F(1, 66) = 3.12, p = .08, d = 0.43 \)). However prospect-refuge and walk type were also found to significantly interact (\( F(1, 66) = 9.41, p < .01 \)). The observed means suggest that the field condition participants experienced greater behavioural restoration than the simulation participants but only in the high prospect-refuge environment (see Fig. 6.8). Tukey HSD post-hocs support this, with only the difference between the conditions in the high prospect-refuge environments being significant (\( p < .001 \)).

![Graph showing walk duration vs. prospect-refuge](image)

*Fig. 6.8. Behavioural restoration as a function of prospect-refuge.*

### 6.4 DISCUSSION

The aim of this study was to build on the findings of the previous ones by testing Fisher and Nasar’s (1992) typology of prospect-refuge and measuring the effects on actual restoration in both simulated and real-life natural environments.
Effect of prospect-refuge on restoration

The results of this study clearly indicate that a walk through a natural environment that contains a high degree of prospect and accessibility but low levels of refuge for a potential offender is substantially more restorative than a walk through a natural environment low on prospect and accessibility combined with a high level of refuge. This was found for all four dimensions of restoration tested. The previous research chapters in this thesis have demonstrated that differences in the physical structure of a natural environment according to Fisher and Nasar's (1992) typology can result in significant differences in perceptions of restoration. This is important because the perceived restorative value of an environment may be used as a factor when deciding whether to visit it or not. The results of this study not only build on these findings by demonstrating similar effects on actual restoration, but the congruence between actual and perceived restoration provides further indirect support for Han's (2003) SRRS measure of perceived restoration, suggesting that it can be regarded an indicative and valid measure of actual restoration. This may extend the more theoretically driven implications of perceptions of danger on perceived restoration in natural environments to having some tangible practical implications, especially in regards to the effect of environmental design as the physical structure of the environment can result in significant differences in actual restoration.

A substantial proportion of existing restoration research has compared the restorative capabilities of natural with urban environments (e.g. Hartig et al., 1996; R. Kaplan, 2001; Ulrich et al., 1991). Almost unanimously, natural environments have been found to be more emotionally, physiologically and cognitively restorative than urban environments. This has led to an underlying assumption that natural environments are always pleasant and highly restorative. The results of this study suggest that this assumption is dangerous, demonstrating that a low prospect-refuge natural environment may not be restorative at all and in some cases, may actually increase negative emotion and mental fatigue.
Effect of field vs. simulation condition on restoration

However the difference in restoration between the field condition walks and the simulated laboratory equivalents was less clear-cut, particularly for emotional restoration. With the exception of anger/aggression, emotional restoration was not significantly greater for those taking the field condition walks. In fact the restoration of positive affect was found to be significantly greater for those taking the simulated laboratory walks. Because simulations are not as realistic and do not contain as much sensory information, one would not expect them to be as restorative as their real-life counterparts. Existing research has demonstrated this (e.g. Mayer et al., 2009) and so the results in relation to emotional restoration are somewhat surprising. However as expected, cognitive and physiological restoration were significantly greater for participants taking the field condition walks rather than the simulated laboratory ones. A similar outcome was found for behavioural restoration, although this difference only turned out to be marginally significant. These results may be partly explained by some of the interaction effects that were found.

Interaction effects

For emotional restoration, with the exception of positive affect, all the other dimensions of the ZIPERS reported a significant interaction between prospect-refuge and walk type. These interactions revealed significantly more positive changes for those taking the high prospect-refuge walks. For some dimensions such as sadness and fear arousal, the only significant positive changes in emotion were for those who took the high prospect-refuge field condition walk. However no significant differences in restoration were found between the field condition and the laboratory condition in the low prospect-refuge environment. Because the low prospect-refuge walks did not differ significantly, the only way to obtain a significant main effect of walk type required highly significant differences in restoration between the field and laboratory conditions in the high prospect-refuge group. Although the field condition tended to be more emotionally restorative than the laboratory condition, these differences were not large
enough to produce a main effect. Being somewhat exploratory in nature, this study did use a fairly small sample size. It appears likely that these differences may have approached significance if a larger sample was used. However for both cognitive and physiological restoration, significant main effects of walk type were found, with the field condition walks being more restorative than the simulated laboratory ones. Once again no significant differences were found between field and laboratory walks in the low prospect-refuge environment, but in the high prospect-refuge environment, the field condition was significantly more cognitively and physiologically restorative. Although it is unsurprising that a walk through an actual environment is more restorative than a walk through a simulated representation, these results suggest that this is only the case for a pleasant and highly restorative natural environment. The restoration of cognition and physiology is substantially greater following an actual walk through such an environment than a simulated one, while the effect appears weaker for emotional restoration. But how can we explain this? No significant differences in behavioural restoration were found in the low prospect-refuge environment between the field and laboratory conditions. However in the high prospect-refuge environment, the field condition was substantially more restorative than the laboratory condition. Therefore the greater restorative effects of a high prospect-refuge environment and in particular, walking through the actual environment as opposed to a simulated equivalent appears to be a likely consequence of participants choosing to spend more time in the environment. Both SRT and ART theories of restoration advocate some form of behavioural tendency, with a restorative environment encouraging approach and exploration. These results provide clear support for this. Presumably because there is more sensory information that people want to experience and explore in an actual restorative environment as opposed to a simulated version of it, this is why participants chose to spend longer in the actual environment, consequently deriving more restorative benefits. However in a low prospect-refuge environment, people are less keen to explore because it is perceived as more dangerous and so the extra sensory information from the actual environment is not explored. As this study wanted to focus on the effects of prospect-refuge on actual restoration, it did not explicitly measure fear and perceptions of danger. Although in hindsight this may have been useful, particularly to check whether the differences in
behavioural restoration coincided with differences in perceptions of danger and fear, the ZIPERS measure did contain an item measuring fear arousal. Fear arousal was significantly lower for the high prospect-refuge walks. The direction of these results added to the findings of the previous research chapters and supports the idea that the participants chose to spend longer and explore an environment that evokes less fear.

\textit{Conclusion}

To the researcher's knowledge, this is the first time that actual behavioural restoration in the form of approach/avoidance behaviour has been explored. This is important because both main theories of restoration advocate that people tend to approach and explore a more restorative environment and the results of this study clearly support this. Existing restoration research has tended to use sequential slides, videos or fixed duration field walks (e.g. Hartig et al., 1996; S. Kaplan, 2001; Ulrich et al., 1991). By preventing participants from having behavioural freedom to either approach or avoid an environment, it is possible that the true restorative value is not measured. Such techniques may be making participants spend less time in an environment they do want to be in (high restoration) and more time in an environment they do not want to be in (low restoration). Therefore the inclusion of measuring behavioural tendency such as the perceived behavioural restoration dimension included in Han's (2003) SRRS appears quite important. These results may also provide important practical implications. If people choose to spend longer in an environment, then not only might they derive greater restorative benefits, but they may also participate in more exercise and recreation which may themselves provide important health benefits. These results once again suggest that adopting Fisher and Nasar's (1992) typology of prospect-refuge to design and manage country parks so that they contain a high level of prospect and accessibility but a low number of hiding places could be one way of maximising the restorative benefits of contact with such environments.
6.5 THE NEXT STEP FOR THIS THESIS

The previous three research chapters have explored the research area using a number of quantitative experimental designs. The results of this chapter have extended the research area by applying Fisher and Nasar’s (1992) typology within real-life natural environments and measuring actual restoration. A fairly consistent pattern has emerged over the previous research chapters relating to the effect of prospect-refuge on both perceived and actual restoration and in simulated and real environments. Prospect-refuge also appears to play an important role in the perception and reaction to different types of danger threat and dangers. The researcher feels that the final step this thesis should take involves exploring some of the more interesting findings regarding the effects of different types of danger on restoration and the interaction with environmental design using a qualitative framework. This may yield a greater insight and deepen our understanding of the processes involved when people confront sources of danger in supposedly safe and restorative natural environments by approaching the research area from a different perspective.
CHAPTER 7

A QUALITATIVE EXPLORATION OF PERCEPTIONS OF DANGER WITHIN A COUNTRY PARK

7.1 INTRODUCTION

This thesis has examined perceptions of danger, feelings of fear and the effect they have on positive perceptions such as preference and restoration within a specific type of natural environment. The previous research studies were all experimental and quantitative in nature, making and testing several assumptions about the environmental and contextual features that influence these perceptions and feelings. This study adopts an alternative approach by using a largely qualitative framework to explore the type of dangers, the physical features that enhance or reduce such perceptions, and how this relates to the perceived restorative properties of an environment. This is important for several reasons. Firstly, by seeing what physical features are reported, it provides an alternative way of testing Fisher and Nasar’s (1992) typology of prospect-refuge within a natural environment. Secondly, it offers an insight into the specific types of danger that people may expect to encounter, the impact they may have and whether any specific physical features may contribute to the perception of specific types of dangers. Finally, it allows the apparent negative relationships between perceived danger and fear with perceived restoration to be explored using verbal accounts to compliment the experimental quantitative research that has been conducted as part of this thesis so far.

Summary of relevant research

Consistent with Fisher and Nasar’s (1992) typology, visibility is of paramount concern in evaluative reactions within forest settings, with low visibility being appraised as more dangerous. Herzog and Kutzli (2002) concluded that physical features that impede visibility (or prospect) and locomotor access (or escape) were positive predictors
of perceived danger within a series of forest settings. Furthermore, Stamps (2005) showed that impressions of safety appear more strongly influenced by locomotive rather than visual permeability. Openness (Herzog & Chernick, 2000) and border visibility of pathways and visual access have also been found to be negatively related to perceived danger (Herzog & Kirk, 2005). The previous studies described in this thesis also support these findings highlighting the importance of visibility, with ratings of perceived danger (in general terms) tending to be significantly higher as prospect-refuge (according to Fisher & Nasar's (1992) typology) diminishes. A low prospect-refuge environment is characterised by impeded prospect and accessibility, but as containing a large number of potential hiding places for a potential attacker. Conversely a high prospect-refuge environment is characterised by clear prospect, uninhibited accessibility and containing few potential hiding places for a potential attacker.

Unlike the vast majority of existing literature, the previous chapters in this thesis have made clear distinctions between the different types of danger that may be encountered in a natural environment. Of the limited existing literature that has made the distinction between different types of danger, the perceived likelihood of encountering a social danger and not a physical danger has been found to be a negative predictor of preference (Herzog & Smith, 1988). However the previous chapters have extended the research area by also examining the relationships of specific types of danger with perceived restoration. To an even greater extent than preference, the results have demonstrated that both the perceived likelihood of encountering a social danger and becoming lost are significant negative predictors of perceived restoration. In support of Herzog and Smith (1988), the perceived likelihood of encountering a physical danger was not found to be a significant predictor. This is possibly because, unlike the other two types of danger, it failed to be a significant predictor of fear. A severe social danger threat has also been found to be far more detrimental in terms of higher perceptions of danger and feelings of fear but lower preference and perceptions of restoration than either a threat stemming from a physical danger or from becoming lost. Further exploration of the role of social danger has also found that the imagined presence of a severe social danger to be extremely detrimental to the perceived restorative value of walking through a country park.
Previous research using Fisher and Nasar’s (1992) typology of prospect-refuge has been largely confined to urban environments such as alleys and university campuses (e.g. Fisher & Nasar, 1992; Nasar & Jones, 1997; Petherick, 2000/2001; Wang & Taylor, 2006) whereas the studies in previous chapters of this thesis have applied the typology to a specific type of natural environment. In the absence of any specific threat or danger, the expected pattern of a higher prospect-refuge environment being perceived as less dangerous or fear-evoking than a lower prospect-refuge environment was found for walks through both real and simulated environments. Higher prospect-refuge environments were also found to be more preferred and restorative (both perceived and actual) than lower prospect-refuge environments. However the effect of prospect-refuge on the perception of social danger has revealed some very surprising results. In particular, the perceived likelihood of encountering a social danger has not been found to differ between a low and high prospect-refuge environment. It also appears that both the threat and imagined presence of encountering a social danger has such a negative impact on perceptions of an environment (higher perceived danger and lower perceived restoration), that it overrides the mediating effect of prospect-refuge. As a result, social danger appears to have a greater detrimental impact in a high prospect-refuge environment than a low prospect-refuge one. It was speculated that people may expect the worse in a low prospect-refuge environment because of the affordances it offers to a potential offender. As a result, an explicit social danger does not have much of a detrimental effect whereas in a high prospect-refuge environment which is supposed to be safer, it may come as such a surprise, resulting in a much greater negative effect. It is hoped that adopting a qualitative framework such as the one adopted by this study may provide further insight and an exploration of these interesting findings from the previous research chapters.

Background and rationale for choice of methodology

The researcher decided upon a methodology that combined a visual card sort task (VCS) with a series of open-ended questions that sought to get participants to explain
their choices and categorizations. These responses were then chosen to be analysed using Interpretative Phenomenological Analysis (IPA).

Canter, Brown and Groat (1985) claim that understanding the categories people use and how they assign concepts to these categories is a very useful way of analysing human behaviour and cognition. Because categorization schemes are employed by people in their everyday lives, understanding them helps to evaluate an individual’s personal framework for making sense of the world. The VCS is consonant with the psychology of categorization and is a suitable technique to represent how a particular knowledge domain is categorized by an individual (Canter et al., 1985). Concept sorting approaches such as the VCS are heavily grounded in cognitive theories and have an important basis in the qualities of objects or concepts (Mervis & Rosch, 1981). The VCS assumes that schemas or memorized data structures are used by an individual to categorise and organise their world. These categorizations are a result of an individual’s preferences, experiences, identification, memory, learning and knowledge about a concept or object and can have profound effects on one’s inferences and behaviours (Rosch, 1977).

The VCS works by having participants look through a series of cards and familiarize themselves with them before being asked to sort them into groups on the basis of commonality of elements within particular groups. Once sorted, the participant is then asked to explain why they have placed the cards in specific groups. They may then be asked to conduct multiple sorts. Canter et al. (1985) suggest that two or three sorts are common and that up to seven or eight sorts are possible.

The responses to the open-ended questions that sought explanations behind participant’s choice of group membership were analysed using IPA. This technique is especially useful in exploring real and meaningful experiences in an individual’s life in a manner that balances description with interpretation. Given that all participants were regular visitors to country parks and had indicated some experience of encountering a danger or perceiving a threat in these environments before, IPA was deemed to be a suitable technique to adopt. In addition to this, although other qualitative techniques such as grounded theory could have been used, the majority require analysing responses without any prior knowledge of the research area. As an extensive literature review and
several quantitative research studies had been conducted by the researcher prior to this study, it was felt that IPA represented the best technique to analyse responses.

7.2 METHOD

Participants

Six participants consisting of undergraduate and postgraduate students from the Human Sciences faculty of the University of Surrey participated in this study (3 female; \( M = 21.83 \) years, \( SD = 2.32 \) years; 19-25 years). They were recruited using posters advertising for participants who were native English speakers, visited country parks on a regular basis and could recall experiencing some form of danger being in such an environment. These posters were placed around the faculty building and participants contacted the researcher directly via e-mail. Participation was voluntary and no compensation was given.

Data collection and analysis

Participants were taken to a laboratory room and seated at a table facing the researcher. Following consent for the interview to be taped, the researcher shuffled a series of 64 numbered photographs of scenes from the Queen Elizabeth Country Park near Portsmouth, England. The photographs were the same initial set of 64 photographs taken from around the park that the simulated walks from the first two studies were taken from. All photographs were taken on a July afternoon under sunny and clear weather conditions. To prevent any attention being drawn away from the landscape, photographs did not contain other human beings or animals.

Participants were instructed to look through the photographs and familiarize themselves with them as the purpose of the research was being explained. They were then instructed that they would be asked to sort the photographs into as many groups as they wanted ranging from low to high as part of two separate tasks before being asked to explain the reasoning behind their choices.
The first card sort task asked participants ‘Which photographs do you think represent the most dangerous places to be in?’ Following the card sort, the researcher took the two most extreme piles, made a note of the photograph numbers before spreading them out on the table. Participants were then asked to explain their choices using a semi-structured interview that allowed all relevant topics to be covered whilst giving enough flexibility for participants to pursue issues that they regarded as important. A series of open-ended questions were devised to explore the type and effect of different dangers that people perceive within a country park and what physical features contribute or minimize these perceptions. Participants were asked to explain why they had chosen the photographs as either dangerous or not dangerous, what physical features contributed to their choices of whether it was dangerous or not and how imagining being in the photographs made them feel. Following this, they were then asked to describe the specific dangers that could be encountered in each group, their personal experiences in such places and who else they thought would visit these places.

The second card sort task asked participants ‘Which photographs represent places that you would prefer to be in following a very busy, stressful day?’ They were then asked to explain their choices including how they anticipate being in such places would effect their emotion, attention, physiology and behaviour. All interviews took between 20-35 minutes and the order in which the two card sort tasks were completed was randomized between participants to prevent order effects. A copy of the interview schedule can be found in Appendix D.

During analysis, all identifying data was removed to ensure confidentiality of participants was maintained. Participant’s responses to the open-ended questions were analysed following the IPA guidelines proposed by Smith, Jarman and Osborn (1999). Taking an idiographic approach, as suggested by Smith (2004), this involved treating each participant as a separate entity with properties that set them apart from other individuals. Each transcript was read and re-read by the researcher who conducted that specific interview so that they became intimate with the account. The next stage involved the researcher noting comments relating to the participant’s responses that he regarded as interesting or significant. As suggested by Smith et al. (1999), these comments included preliminary interpretations, associations and summaries. The
interview was then re-read and the titles of any emerging themes were noted. Connections between emerging themes were then taken into account and these were arranged into super ordinate concepts. A table of master themes was then devised from these concepts. This procedure was completed for each transcript individually as Smith et al. (1999) claim that treating each transcript individually is an appropriate way for analysing studies of up to ten participants.

The researcher then consolidated the master themes from each individual transcript to produce a final table of themes and sub themes were produced. This was done using a cyclical process where themes were dropped if new, more useful ones emerged from other transcripts.

7.3 INTERPRETATION OF FINDINGS

The photographs shown in the following Figures were commonly selected and made reference to by participants. Figs. 7.1-7.4 were unanimously selected as low danger and high restoration examples.

Fig. 7.1. Example 1 of low danger and high restoration selection

Fig. 7.2. Example 2 of low danger and high restoration selection
Fig. 7.3. Example 3 of low danger and high restoration selection

Fig. 7.4. Example 4 of low danger and high restoration selection

Figs. 7.5-7.8 were unanimously selected as high danger and low restoration examples:

Fig. 7.5. Example 1 of high danger and low restoration selection

Fig. 7.6. Example 2 of high danger and low restoration selection
A summary of the master themes that arose from the data is given in Table 7.1.

**Table 7.1.**

*Summary of the master and sub-themes arising from the participant’s responses*

<table>
<thead>
<tr>
<th><strong>Dangers</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The role of the physical structure</strong></td>
</tr>
<tr>
<td>Prospect: control and orientation</td>
</tr>
<tr>
<td>Refuge</td>
</tr>
<tr>
<td>Accessibility</td>
</tr>
<tr>
<td><strong>Expectations</strong></td>
</tr>
<tr>
<td>Restoration</td>
</tr>
<tr>
<td>Other users</td>
</tr>
</tbody>
</table>

**Dangers**

When probed as to the type of dangers participants felt they were likely to encounter, no dangers were mentioned from the low danger photographs selected. In support of the distinction made between different types of danger throughout this thesis, expectations of physical and social danger figured prominently in the photographs selected as containing a high level of danger.
H (33) I expect these sorts of places to harbour dangers, you know, like being attacked, coming across dangerous animals like snakes or me just injuring myself by falling over. When I'm in these places, I try to get out quickly. (see Fig. 7.7)

A (43) Wow, well there are so many different types of danger, like other people, big animals but also more little dangers, more hassle than anything else you know, like creepy crawlies, insects or getting scratched by branches.

C (41) Although there's always a chance of being attacked by some other person, that's the big danger, I think other less dangerous things too could happen, like getting lost, disturbing a big animal, things falling on you. (see Fig. 7.5)

In support of the distinction between different types of danger and some of the findings from previous research chapters, these responses demonstrate some variation in the level of severity that different types of dangers are perceived to have. Physical dangers and other 'lesser' dangers appear to represent more of a hassle and an inconvenience whereas social dangers appear far more severe.

Participants appeared to be very aware of the threat of being attacked by another person, particularly within the high danger photographs they selected. Some responses indicated a greater expectation of being attacked in this sort of environment.

A (49) I feel like I would probably be more likely to be attacked in these dangerous photographs, but only really severe attacks like rape or violence because I would be more alone, away from help. It really would be a surprise in the other sort of places because they're just examples of nice nature, what you expect a park to be like and so you don't think about dangerous people.

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b Refers to participant initial (line number from transcript)
c Responses made in reference to a specific figure (i.e. Fig. 7.7). If no specific figure cited, response is made to whole group from card sort (e.g. most dangerous selections)
However other responses suggest that the perceived likelihood of being attacked by another person is fairly similar between the low and high danger photographs. Instead what makes an environment more dangerous is the diminished ability to cope or deal with the threat of being attacked because of the physical structure of the environment.

S (36) Even as a man who feels pretty confident of defending himself, this sort of place favours an attacker because they can lurk and wait, catch me off guard. The other places give me a much better chance of fighting back because I can see better. I bet you could be attacked in either place but at least these nicer photos give you a better chance to fight back and do something about it. (see Fig. 7.8)

H (39) I suppose that if a rapist or mugger wants to attack you they will, so it could happen in any of these photographs. In fact someone tried to attack me in what I thought was a nice safe park a couple of years ago. But I definitely feel more in control of the situation in the photos with paths and that are more open. I think, there's probably a greater chance of more people about to help too.

These responses are very interesting because they offer a potential explanation as to why no significant difference in the perceived likelihood of being attacked was found in the first research chapter between the low and high prospect-refuge natural environments. The responses indicate that elements of perceived control and perhaps severity may play an important role in overall perceptions of danger and emotional reactions to a natural environment. This supports the measure of perceived danger employed by later research chapters. There also appears evidence to suggest that when in a low prospect-refuge environment, people are likely to be on edge almost expecting to encounter a danger, particularly a social one. Therefore it is probable that if they were to encounter one, it becomes less of a surprise and consequently has less of a negative effect. Although there was no direct evidence to suggest that encountering danger in a high prospect-refuge environment would be a surprise, participants did indicate that they felt safe in such environments and so by not talking about the effect of danger, indirectly suggests that encountering a danger in such an environment would come as a surprise.
Therefore although they may be better equipped to deal with such an encounter in a high prospect-refuge environment, it may have a more detrimental effect on perceptions of the environment because of the greater unpleasant shock it would have compared to a similar encounter in a low prospect-refuge environment.

The role of the physical structure

Prospect: control and orientation

This master theme emphasises the role of prospect in participant’s perceptions of an environment and in particular, the roles of control and orientation. Prospect is broadly defined by Appleton (1975) as any feature of situation which directly facilitates observation or indirectly suggests an opportunity to extend the field of vision. The role of prospect is heavily prominent in theories of landscape assessments (e.g. Appleton, 1975; Fisher & Nasar, 1992) while previous research in natural environments has also emphasized the importance of prospect in preference (e.g. Kaplan & Kaplan, 1989) and danger judgements (e.g. Chapin, 1991; Herzog & Kirk, 2005). Responses support this existing research, indicating the necessity of being able to see into an environment and the area ahead to feel safe from danger.

B (2) It's very dark and sinister, making it so much harder to see. That's scary. (see Fig. 7.5)

C (8) It's not just people, animals too. High trees, smallish bushes, no really thick vegetation. If I can see more then I feel safer and less scared.

H (4) I like being able to see where I am going and where I have been because it keeps me relaxed, you know, I can enjoy the view because if there is anything dangerous, like an animal or another person, I will probably be able to see it coming because I am higher than them. (see Fig. 7.1)
Higher levels of prospect also appears very important in giving participants control over a dangerous situation because of the greater forewarning it offers, allowing the participants to take an appropriate course of action.

C (1) These photos I have chosen make me feel safe because they allow me to see further, I then know what’s ahead of me. I suppose it’s just, no surprises, these sort of places give you time to see a potential problem and think of something to do about it, like run away back where you came from. (see Fig. 7.4)

In support of this, a lack of prospect contributes to negative perceptions and feelings of fear because of the uncertainty and lack of control participants feel when in such an environment.

R (3) I just don’t feel safe if I can’t see where I’m going, I have no control and it makes me feel scared. Your mind just thinks of all the dangers that could be lurking just round the corner or the other side of that tree. (see Fig. 7.7)

H (9) One of my friends was mugged in this sort of place, and you hear stories of weirdos flashing and stuff like that. But I think it could happen in any park, it’s just in this sort of part of a park (points to high danger examples), it’s so much harder to fight back or escape, if someone wanted to attack you they could plan and wait. In the more open park pictures, I feel that I could see them better, be more prepared and do something about it.

Prospect appears to provide an important element of forewarning and control in response to both social and physical dangers.

S (5) I feel more in control here, I can see any potential dangers before they happen and can act accordingly. So for example if someone else was coming and I saw them before they saw me I could use the surroundings to avoid them seeing me.

H (6) If a dog was loose, I could see it coming from a long way off and try to get out of it’s way, or at least hope the owner calls it back before it reached me. (see Fig. 7.3)
A (1) These places I have chosen (points at low danger selection), well, if I came across a scary animal or a snake or spider I would be less scared than the other places (points at the high danger selection). This is because I think I could see the danger much sooner and so be able to do something about it. You know, like try to avoid it, run away, pick up a stick or something.

Not only does prospect play an important role in the forewarning of danger, but it also plays an important role in helping participants keep track of where they are in an environment. Previous research has demonstrated that people fear becoming lost in natural environments (e.g. Bixler & Floyd, 1997; Coble et al., 2003). The results of previous research chapters in this thesis also suggest that becoming lost is a real danger that may damage positive experiences in a natural environment. By facilitating orientation, prospect can help reduce the chances of becoming lost. This results in participants feeling safer from the danger of becoming lost.

R (12) I can see where I’m going, where I’ve been and what’s around me in these sort of places. I think it would be very hard to get lost here because it’s so nice.

S (12) In this sort of environment (points to the high prospect group), I feel much safer from getting lost because it’s easy to see where I have been and where I could go. It’s like I feel a lot more certain of where I am in relation to everywhere so don’t have to think about trying not to get lost.

Refuge

The master theme of refuge was very interesting because participants seemed to interpret refuge in one of two ways – either as hiding places for an attacker or potential danger (consistent with Fisher & Nasar’s [1992] interpretation) or as a source of refuge for themselves (consistent with Appleton’s [1975] interpretation). Although the same type of physical features such as trees, bushes and shadow were mentioned, the way in which refuge was interpreted appears to interact with prospect, with refuge being interpreted as a source of refuge for the participant when prospect is high.
B (11) Some of these places, I am in the shadows or hidden from view from others but can see into the distance. I like this, it makes me feel much safer because I am more prepared if other people are about.

A (8) I remember once walking through a quiet park and coming across a clearing where there were some badgers who I could see but they didn’t see me because I was slightly higher than them and had some bushes to hide behind. It sounds silly but you hear that badgers can be quite aggressive, so being able to see them without them seeing me made me feel safe. (see Fig. 7.3)

However when prospect was interpreted as being low, refuge was interpreted negatively as a hiding place for a variety of potential dangers.

B (16) These places are scary because you can’t see what’s going on around you, anything could just jump out of the bushes or from behind a tree, no warning. Plus there could be snakes or creepy crawlies in that undergrowth. I think it would be very easy to trip up, fall over and break an ankle.

S (14) Although I think someone could try to attack you in both places, I think it would be much worse in this sort of place, you just have less control because you can’t see as much, there are so many hiding places for someone to just jump out at you completely out of the blue. They could then drag you into the dark undergrowth and nobody would see.

C (8) These places have lots of places for a creep to hide and jump out and attack you. He can see you coming but you can’t see him. He could hide behind hedges, that tree, the shadows make it dark and hard to see him. (see Fig. 7.5)

Accessibility

Participants commonly made reference to physical features such as paths and an absence of obstacles as contributing to feelings of safety from sources of danger. This supports previous work by Herzog and colleagues who have shown features such as pathways and border visibility are negatively related to perceptions of danger (e.g.
Herzog & Chernick, 2000; Herzog & Kirk, 2005) while locomotive permeability is extremely important to enhance feelings of safety (e.g. Stamps, 2005).

S(19) These more open environments just feel safer because there’s less going on. I don’t feel like I could trip over and hurt myself because there are paths and not many things in the way or sticking up like tree roots.

A (20) Being able to walk through the park easily is important for me to feel safe, something like a clear path to follow is really important for that.

This appears not only to be as a result of less obstacles to injure oneself on, but such physical features provide a better escape in the face of any potential dangers. This ties in strongly with Fisher and Nasar’s (1992) typology of prospect-refuge that advocates an environment is perceived as safer and less dangerous if a potential victim has better escape options.

A (24) If anything happened, it would be so hard to get away. Which way would you go? It wouldn’t be easy to get away fast through that place because of the obstacles, trees, bushes and no clear path.

Expectations

Restoration

Consistent with advocates of evolutionary theory (e.g. Ulrich, 1993), the photographs that were selected as being the most restorative contained physical features that afford survival such as flowing water, greenery and good prospect.

C (31) Lots of greenery, flowing water. I can see everything down around me. It’s just really relaxing.

There is also evidence to suggest that participants felt that the same photographs would induce the restoration of capabilities as proposed by the two main theories of
restoration (SRT and ART). This included more positive emotions, forgetting everyday distractions by resting directed attention and reducing stress.

C (34) I think that I would want to come here because it just feels more like what I expect nature to be like, you know, sunshine, the wind, great views. It would really cheer me up. (see Fig. 7.1)

H (30) It’s just friendlier and so I want to stay here and explore it, really take my time to have a look round because it helps me get over a stressful day. I can do my own thing and let my body unwind and calm down after a busy day.

A (38) To relax, I need somewhere where that makes me feel happy and forget the busy day I have had, there are so many nice distractions here. It would really help me do this.

Not only does the consistency of low danger photographs being selected as the most restorative and vice-versa further support the claims of previous research chapters that danger and restoration are negatively related, but some responses indicate the need to feel safe from danger in order to relax. This makes sense on theoretical grounds too, with both Ulrich (1983) and Kaplan (1995; Kaplan & Kaplan, 1989) implying that an environment that is not perceived as safe either increases stress or is not compatible for restoration because it prevents directed attention from being rested.

R (28) I feel safe here and free to explore and relax. I don’t have to worry about weirdo’s.

Conversely the following responses were in reply to questioning about the low restoration photographs that participants had selected. Perceived threats, obstacles and uncertainty appear heightened because of the physical structure of the environment, implying participants feared the worse. Worrying about threats may even induce negative changes in emotion, physiology and attentional capacity.
B (39)     The places in these pictures just don’t make me feel relaxed, there are obstacles to get past and I wouldn’t know where to go. It would just be a hassle which is not what I want when I’m trying to relax.

C (38)     I would constantly have to keep an eye out for where I am going, things to avoid and other people suddenly appearing. I think it would make me feel more stressed than when I started!

Other users

There were also very distinct differences in the sort of people participants felt were likely to use the environment whether it was chosen as a dangerous example or not. Responses from the low danger photograph selections suggest that participants perceive other users to have similar rather than sinister intentions.

B (22)     In this sort of place, I expect other people to be about using it like I do, to relax or walk their dog.

R (17)     Just ordinary people like you and me, out and about enjoying the place. You can see them around you. Young families, couples, older people, just normal people I suppose. (see Fig. 7.2)

C (12)     I often go to places like this and normally find friendly people who smile and say hi when I walk past them. (see Fig. 7.3)

However this is in stark contrast to responses from the high danger photographs that were selected. Here it appears that participants feel that other people in the environment are ‘up to no good’ because the physical environment facilitates concealment and suspicious behaviour. This shares a high level of concordance with Cohen and Felson’s (1979) routine activity theory (RAT) which states that concealment facilitates crime.
A (27) Seeing as this is a dark and scary place, I would wonder why people are about, they're probably up to no good. You might suddenly see them doing something dodgy, like burying a body or something.

S (30) A man in his 20's or 30's, really trying to blend in. Probably wearing sunglasses or a hoodie, definitely someone who doesn't want to be seen. Probably quite big too. (see Fig. 7.8)

7.3 CONCLUSION

This final research chapter used a qualitative design to provide further support for the distinction between different types of danger, what factors make them dangerous and how the physical structure of the environment can enhance or reduce these perceptions. A substantial number of responses from participants were interpreted as supporting Fisher and Nasar’s (1992) typology of prospect-refuge, with features of prospect, refuge and accessibility appearing to be key factors in determining whether a natural environment is perceived as dangerous or not. These features appeared very important in response to the perception of a variety of dangers, with an absence of prospect and accessibility tending to result in refuge being perceived negatively as a potential place for attackers. This appeared to heighten perceptions of danger, not necessarily through an increased perceived likelihood of a danger, but because the danger was perceived as having greater severity and the physical structure helping to diminish the perceived control an individual felt they had over a danger. In support of the pattern found in the previous research studies, these types of environments were also found to be perceived as least restorative.

The VCS is minimally intrusive, quick to administer and because of the structured nature of the task, can help participants organise their cognitions more easily (Canter et al., 1985). It therefore seemed to be a good basis to explore participant’s perceptions. Using IPA to explore the research area also proved an extremely useful methodology because it allowed the subjective nature of the VCS to be explored and understood using a far richer and fuller account than a quantitative methodology. The
previous research chapters have all been quantitative in nature and applied Fisher and Nasar's (1992) typology to examples of a natural environment. IPA allowed the researcher to work from a theory generating rather than theory testing perspective, by getting participants to describe the type of dangers they felt could be present and explain what they felt made an environment feel safe or dangerous. It must be conceded that this research study does represent a subjective interpretation and because it was conducted following the preceding research chapters, it is possible that the researcher placed greater emphasis on remarks made that agreed with previous findings or literature. Nonetheless the use of a qualitative methodology such as this helps broaden our understanding of the crucial role that the physical structure of a natural environment plays in perceptions of danger and restoration. Such techniques are fantastic compliments to the more experimental quantitative methodologies typically used within the restoration literature.
CHAPTER 8

DISCUSSION

The aim of this thesis was to explore the effect of perceptions of different types of danger within a country park on positive perceptions such as preference and restoration. The interaction of these perceptions with the physical structure of the environment was also explored using Fisher and Nasar’s (1992) typology of prospect-refuge as a framework. The five research studies conducted as part of this thesis help to broaden our understanding of the relationships between and the effects of danger (both overall and specific) on the perceived restorative value of an everyday natural environment. By also manipulating the physical structure of the environments that respondents and participants were exposed to, the role of environmental design in managing these relationships and effects was also explored. With the inclusion of country parks in UK public health strategies and an active redevelopment of old brownfield sites into country parks, it was felt that exploring this research area could have important theoretical and practical implications regarding the physical design of such environments to maximise their restorative potential. This may ultimately determine the success of any health strategies that they may be incorporated in. As natural environments are commonly sought out for their restorative properties despite the potential dangers they may contain, understanding the effect of different types of danger on perceptions of restoration poses important theoretical implications regarding the distinction between different types of danger and the relationships they share with perceptions of an environment. This is something that has been largely negated by existing research.

8.1 SUMMARY OF RESULTS

The first research study (chapter 3) examined whether variations in the physical structure of a simulated walk through a country park according to Fisher and Nasar’s
(1992) typology resulted in different perceptions of danger, fear, preference and restoration in addition to studying the relationships between these perceptions. Fisher and Nasar’s (1992) typology of prospect-refuge states that environments that contain high levels of prospect and accessibility but a low number of hiding places are perceived as less dangerous (high prospect-refuge) than environments low in prospect and accessibility but which contain a high number of hiding places (low prospect-refuge). Three simulated walks that differed in levels of prospect-refuge according to the typology were devised for the study. The typology has been successfully applied to urban environments to explain perceptions of danger (e.g. Fisher & Nasar, 1992; Nasar & Jones, 1997; Petherick, 2000/2001; Wang & Taylor, 2006) while features consistent with prospect and accessibility in forest environments have also been implicated as negative predictors of preference (e.g. Herzog & Chernick, 2000; Herzog & Kirk, 2005; Herzog & Kutzli, 2002). However despite this clear support for the typology to work within natural environments, to the researcher’s knowledge, this was the first time the typology had been explicitly tested within such an environment. It was also the first time the typology had been extended to explore differences in perceptions of restoration. The typology proved successful, with higher levels of prospect and accessibility but a lower number of hiding places being perceived as significantly less dangerous or fear-evoking and more preferred and restorative than environments with lower levels of prospect and accessibility and a higher number of hiding places. However the effect of variations in prospect-refuge in relation to the perceived likelihood of encountering social danger, physical danger or becoming lost revealed one rather interesting result. Although the perceived likelihood of encountering a physical danger or becoming lost significantly decreased with increasing levels of prospect-refuge, no significant differences were found for the perceived likelihood of encountering a social danger between the three prospect-refuge conditions. This finding was hugely surprising given that Fisher and Nasar’s (1992) typology is based on the perceived threat within an urban environment which typically stems from a social source. As previously mentioned, the typology had received substantial empirical support within urban environments and indirect support from forest environments. Work within urban parks has also demonstrated that a high level of dense understory vegetation impedes prospect and offers potential attackers a
place to hide that results in a higher fear of crime (e.g. Fisher & Nasar, 1992; Kuo et al., 1998; Troy & Gove, 2008). It was posited that because a country park represented a more rural example of a natural environment than an urban park, respondents may not have perceived there to be much of a threat of social danger. Indeed because there was no danger actually present or threat manipulated respondents may have generalised the perceived likelihood of encountering a social danger to a country park environment as a whole irrespective of the physical structure of the environment.

In terms of the relationships between variables, as expected and in support of previous research within natural environments (e.g. Herzog & Kutzli, 2002), perceived danger and fear were found to share a strong positive relationship. An expected strong positive relationship was also found between preference and perceived restoration, providing support for the idea that perceived restoration may be used as an implicit frame of reference when making a preference judgement (Purcell et al., 2001). Given these expected relationships and that perceptions of danger would be counterintuitive to the restoration process, both perceived danger and fear were expected to share a strong negative relationship with preference and perceived restoration. These relationships were found but interestingly, fear was found to have a significantly stronger negative relationship with both preference and perceived restoration than perceived danger. One possible explanation for this is that in some situations perceptions of danger can be attractive (e.g. extreme sports, Loeffler, 2004) while overcoming some physical dangers and challenges may result in a sense of mastery and accomplishment (e.g. Kaplan & Talbot, 1983). Conversely fear represents a more extreme and almost unanimously negative reaction as a result of its evolutionary connection with threatening survival (Ulrich, 1983). There is clear theoretical support for perceptions of danger and fear to have a negative effect on perceived restoration from both SRT and ART theories of restoration. There is also indirect empirical support for this from the positive relationship between fear and perceptions of danger (e.g. Herzog & Kutzli, 2002), the negative relationship between perceptions of danger and preference (e.g. Blöbaum & Hunecke, 2005; Herzog & Flynn-Smith, 2001; Herzog & Miller, 1988; Nasar & Fisher, 1993), and the positive relationship between preference and perceived restoration (e.g. Han, in press; Purcell et al., 2001). Despite this body of indirect support, to the researcher's
knowledge, this is the first time the relationships between perceived danger and fear with perceived restoration had been explicitly tested and stated.

The distinction between different types of danger was also important. Previous research has identified a range of social and physical dangers that one could encounter within natural environments (e.g. Bixler & Floyd, 1997; Burgess, 1998; Coble et al., 2003, Kaplan & Talbot, 1983; van den Berg & ter Heijne, 2005). However the vast majority of research that has examined perceptions of danger within natural environments has not made this distinction and instead focused on the perceived likelihood of coming to harm in general terms (e.g. Herzog & Chernick, 2000; Herzog & Kirk, 2005; Herzog & Kutzli, 2002; Herzog & Miller, 1998). This first study found that the perceived likelihood of encountering a social danger, physical danger and becoming lost were all significant positive predictors of perceived danger. However only the perceived likelihood of encountering a social danger or becoming lost were significant predictors of fear (positive), preference (negative) and perceived restoration (negative). The results clearly indicate that of the three dangers investigated, it is the perceived likelihood of encountering a social danger that is the most detrimental in terms of higher fear, lower preference and lower perceived restoration. Of the limited existing research that has made the distinction between different types of danger, Herzog and Smith (1988) also found social danger but not physical danger to be a significant negative predictor of preference. The results of this study support Herzog and Smith (1988) but also build on it by exploring the relationship with perceived restoration, demonstrating that only the perceived likelihood of encountering a social danger or becoming lost and not physical danger were significant negative predictors of different dimensions of perceived restoration. Once again, this highlights the clear distinction between the different types of danger one may realistically encounter in a natural environment such as a country park. It also poses potential practical implications regarding the focus of attempts to manage specific perceptions of danger in order to maximize the restorative value of such environments.

The first study also made some gender comparisons. In support of previous research (e.g. Fredrikson et al., 1996; Harris & Miller, 2000; Nasar & Jones, 1997; van den Berg & ter Heijne, 2005), females were found to perceive higher levels of overall
danger and fear than males. The finding that females perceived a greater likelihood of encountering a social danger than males is consistent with previous research that has demonstrated that women express more fear and greater perceived danger about being the victim of aggression and crime than men (e.g. Blöbaum & Hunecke, 2005; Ferraro, 1996; Harris & Miller, 2000; Nasar & Jones, 1997). However no significant gender differences were found for likelihood ratings of becoming a victim of physical and lost danger. These results are interesting because they conflict with findings such as van den Berg and ter Heijne (2005) who found that women typically express more negative emotions than men in response to threatening encounters with nature. It was felt that the exploration of these gender differences represents an interesting line of new research that could warrant a thesis in itself. For that reason and to remain focussed on exploring the effects of different types of danger in natural environments, the rest of the research chapters chose not examine the role of gender. However as a result of these findings, it was ensured that the preceding research chapters consisted of a similar gender balance to this first study to allow more valid comparisons to be made between studies.

The results of the first research study suggested that the research area warranted further investigation, particularly understanding the effect of different types of danger on perceived restoration and the role prospect-refuge can play in this relationship. Of particular interest was the finding that of the three dangers investigated, the perceived likelihood of encountering a social danger was most detrimental to overall perceived restoration, but that variations in prospect-refuge according to Fisher and Nasar's (1992) typology did not result in differences in the perceived likelihood of encountering a social danger. The second research study followed the next logical step for the research to take by examining if similar findings could be found if the different types of danger were more salient. Specific danger threats were manipulated using information boards describing various incidents that had occurred within the environment at the start of the two simulated walks that differed in levels of prospect-refuge. Because the definition of physical danger used in the first study was felt to be too broad, two specific physical dangers were manipulated – being attacked by a wild boar (animal) and the threat of unstable paths causing injury (tripping). Although commonplace within the environmental preference literature (e.g. Herzog & Chernick, 2000; Herzog & Kirk,
2005; Herzog & Kutzli, 2002; Herzog & Miller, 1998; Herzog & Smith, 1988), some researchers claim that perceived danger does not just consist of likelihood estimates, but also consequences of danger (Menzies & Clarke, 1995; Williams et al., 1985; Williams & Watson, 1985) and the degree of control an individual feels they are able to exert on the situation (Rapee, 1997). Similarly to the first study, the measure of perceived danger used in the second study (chapter 4) combined these elements with perceived likelihood estimates of encountering a specific danger to help explore the underlying nature of different types of danger threat.

A total of five threats were created: two physical dangers (animal and tripping), a social danger threat, the threat of becoming lost and a control condition. These threats were crossed with two simulated walks through a country park that differed in levels of prospect, refuge and accessibility according to Fisher and Nasar's (1992) typology. Significant differences between the danger threat conditions were found for the four dependent variables under investigation (perceived danger, fear, preference and perceived restoration). As expected, both the physical and the social danger threats were all perceived as more dangerous than the control condition, with the social danger threat being perceived as the most dangerous. The breakdown of the perceived danger measure also yielded some differences between the danger threats. The social danger threat was perceived as more likely and severe than both physical danger threats and the lost danger threat, while both physical danger threats were perceived as more severe than the lost danger threat. The highly detrimental effect of a social danger threat was also demonstrated by the finding that it evoked significantly more fear than all the other danger threats and control condition. This was further compounded by the finding that none of the other danger threats evoked any more fear than the control condition. In relation to physical danger, this finding may not be overly surprising. Previous research has suggested that overcoming the physical obstacles and challenges that may be present in a natural environment can lead to positive as well as negative emotions (e.g. Kaplan & Talbot, 1983; van den Berg & ter Heijne, 2005) while the previous study (chapter 3) failed to find the perceived likelihood of encountering a physical danger to be a significant predictor of fear. The anticipation of encountering and overcoming physical danger threats may result in some positive emotions that may dilute negative ones such
as fear. The lack of significant findings for perceptions of danger and fear for the lost danger threat was surprising given the previous research chapter’s findings. It was felt that the manipulation of the threat of becoming lost using information boards was less successful than the other danger threats. Becoming lost represents a subjective type of danger that can build up over a period of time whereas both the social and physical danger threats used are more immediate examples of a danger that can be suddenly forced upon an individual. Manipulation checks measuring the perceived likelihood of encountering each of the dangers provide support for this claim, with no significant difference in the perceived likelihood of becoming lost found between the lost danger threat condition and the control condition.

Given the effect of the social danger threat manipulations on perceptions of danger and fear, it is unsurprising that a simulated walk through a natural environment containing a social danger threat received very low ratings of preference and perceived restoration. With the exception of the physical (animal) danger threat, the social danger threat received significantly lower ratings of preference than all other conditions. It was also perceived as significantly less restorative than all the other danger threat conditions. These results provide indirect support to the direct relationships stated in the first study between the perceived likelihood of encountering specific types of danger and overall perceptions such as preference and perceived restoration. A further interesting finding was that of the physical (tripping) danger threat being found to be perceived as less restorative than the control condition, despite it not being perceived as any more dangerous. It was suggested that that although negotiating around and over obstacles may not be perceived as dangerous enough to induce negative emotion, it may represent a hassle whereby an individual has to concentrate on where they are walking and be more physically active to successfully negotiate these obstacles. A walk through an environment where there is a perceivable hassle or inconvenience of injuring oneself from tripping over obstacles may then mean it is perceived as less restorative. In support of this idea, ratings of perceived physiologically restoration were significantly less in the physical (tripping) danger threat condition than the control condition.

The results also revealed expected differences between the two prospect-refuge walks for perceived danger, fear, preference and perceived restoration. Not only does
this continue to support the idea that Fisher and Nasar's (1992) typology can be applied to natural environments to manipulate perceptions of danger and fear, but it also demonstrates that variations according to the typology can result in different preference and perceived restoration ratings. But it was the interaction of prospect-refuge with danger threat that revealed some of the most interesting results. Although only a marginally significant interaction was found for perceived danger, unlike the control condition and physical danger threat conditions, ratings of perceived danger did not differ significantly between the low and high prospect-refuge walks in either the lost or social danger threat conditions.

Further examination of the overall perceived danger measure revealed this finding to be a result of respondents perceiving an equal likelihood of encountering a social danger threat or the threat of becoming lost in both low and high prospect-refuge walks. The perceived severity of both danger threats was also failed to differ significantly between the two prospect-refuge walks. However significant differences between prospect-refuge conditions were found for ratings of perceived control over a social danger and becoming lost, with the high prospect-refuge walk being perceived as affording greater control over the dangers than the low prospect-refuge walk. Presumably the extra prospect, better movement ease for escape and fewer concealment opportunities that are typically present in a high prospect-refuge environment affords better perceived control because they have greater forewarning and options in the event of a social danger. Greater prospect and movement ease may also aid orientation, resulting in greater perceived control over the threat of becoming lost.

Unlike perceived danger ratings, fear ratings across all danger threat conditions were significantly lower in the high prospect-refuge walk than the low prospect-refuge one. This finding is interesting given that it has been claimed that it is logically impossible for something to evoke fear but not be perceived as dangerous (Gabriel & Greve, 2003). The results from the social danger threat condition of this second study contradict this claim. Although the walk through the low prospect-refuge environment was perceived as equally dangerous as the walk through the high prospect-refuge one, it was found to evoke significantly more fear. The reasons behind this are unclear but could be linked to the finding that significant differences in the perceived control of a
social danger threat were found between the two prospect-refuge walks. Rapee (1997) found that unlike physical threat situations, fear experienced as a result of social threat situations could be predicted by the perceived degree of personal control over the threat. From an evolutionary perspective this makes sense as less perceived control over a danger may lead it to be perceived as being a greater threat to survival because an individual has fewer options to counter it. As a result higher levels of fear are likely to be evoked. This ties in closely with work by Lazarus and Folkman (1984) that advocates that fear is a result of a perceived threat and the degree of perceived control an individual feels they have over it.

Although preference judgements and ratings of perceived restoration were also found to differ between the low and high prospect-refuge walks, this was only found to be the case for the control condition and the two physical danger threat conditions. In the lost and social danger threats, the high prospect-refuge walk was no more preferred or perceived as any more restorative than the low prospect-refuge walk. Taking these interactions together the results suggest a pattern whereby generally speaking, in a low prospect-refuge natural environment, a physical or social danger threat has an equally detrimental effect on preference and perceived restoration. However in a high prospect-refuge environment, a physical danger threat (both from an animal or injury from tripping) has no discernable effect on perceived danger or fear and no negative effect on preference or perceived restoration. However in response to a social danger threat within a high prospect-refuge environment, perceived danger is increased and preference and restoration is reduced to levels similar to the threat in a low prospect-refuge environment. These results continue to support the idea of applying Fisher and Nasar’s (1992) typology to a natural environment such as a country park in the absence of any specific danger or threat as it can explain differences in perceptions of danger, fear, preference and perceived restoration. Variations in prospect-refuge can also explain differences in the presence of a physical danger threat. Negative perceptions of nature may be derived from messages from parents, peers and various media such as horror movies and news reports (Bixler & Floyd, 1997) and so on a positive note, it appears that within a high prospect-refuge natural environment, knowledge of a potential physical danger threat does not make an environment be perceived as more dangerous or
fear-evoking, nor is it detrimental to positive perceptions such as preference and restoration. However the presence of a social danger threat appears to be a particularly damaging in both low and high prospect-refuge environments. Unlike existing research that has used the typology to explore perceptions of danger stemming from a social source within urban environments (e.g. Fisher & Nasar, 1992; Nasar & Jones, 1997; Petherick, 2000/2001; Wang & Taylor, 2006) and research using similar design approaches within urban parks (e.g. Kuo et al., 1998; Troy & Gove, 2008), walking through a high prospect-refuge environment in the presence of a social danger threat was perceived as no less dangerous than in a low prospect-refuge one. This suggests that the effect and threat of social danger within a natural environment is so strong, that it overrides prospect-refuge. The threat of being attacked is consistently cited as a fear-evoking type of danger that is perceived as potentially encounterable within a natural environment (e.g. Burgess, 1998; Coble et al., 2003; Koskela & Pain, 2000). With this, theoretical support from the two main theories of restoration, and the negative relationships stated in the first study between perceived danger and fear with perceived restoration, it is unsurprising that the first two studies found the perceived likelihood and threat of social danger to be highly detrimental to the perceived restorative benefits one may derive from walking through a country park. However given the surprising inability of Fisher and Nasar’s (1992) typology to mediate the effects of social danger and the potential implications this could pose for public health strategies incorporating natural environments, the researcher felt it was extremely important to further explore the effects of social danger on positive perceptions such as restoration and continue to examine whether the physical structure of the environment plays any mediating role in these perceptions. As a result, the third study (chapter 5) focused solely on the effects of social danger.

Having previously explored the perceived likelihood of a social danger and then manipulated social danger threat, the researcher felt the next logical step was to manipulate the presence of a social danger. For ethical reasons this was not possible, but the manipulating of social danger through the imagined presence of another person in the environment was possible and had been done by others before (e.g. Herzog & Rector, 2009). Three experimental conditions were devised – control (no manipulation),
moderate social danger (someone walking behind) and high social danger (someone following). The moderate danger was included because having other people walking behind you is a very realistic experience within a natural environment and its inclusion represented a more subtle manipulation of danger than the no and high social danger manipulations. A more immersive simulation method using videos rather than photographic stills to represent a walk through a natural environment was used in this study as there is evidence to suggest that a more realistic and immersive simulation increases the chance of finding significant main effects (e.g. Mayer et al., 2009). Given some of the surprising results in relation to the perception of social danger in different prospect-refuge environments from the research conducted so far, it was felt that this could offer a methodological improvement on the previous studies. Using a 3x2 design, crossing social danger with prospect-refuge, the results revealed a substantial number of main effects and some very interesting interactions.

Although no significant differences were found between the three social danger conditions for ratings of perceived danger, expected significant differences were found for ratings of fear and perceived restoration. In both cases this was a result of the high danger condition being significantly different to both the control and moderate danger conditions in terms of being more fear-evoking and perceived as less restorative. This supports a recent study by Herzog and Rector (2009) who concluded that the presence of a severe social danger in an environment seriously damages its perceived restorative potential. However instead of using visual stimuli, their study only used brief and rather vague descriptions of environments that may have resulted in different interpretations of the environment based on whether participants were given the danger manipulation or not. By using visual stimuli, it is hoped that the results of this study provide a more valid argument pertaining to the detrimental effects of social danger on perceived restoration.

The results of this study also continue to demonstrate that variations in prospect-refuge have a significant effect on perceptions of danger, fear and restoration. Consistent with the preceding research studies (chapters 3 and 4) and hypotheses of this study, the simulated walk through the high prospect-refuge environment was perceived as less dangerous and fear-evoking, and more restorative than the one through the low prospect-refuge environment. Significant interactions between social danger and prospect-refuge
for ratings of perceived danger, fear and perceived restoration were also found. Respondents exposed to the low prospect-refuge walk did not give significantly different ratings of perceived danger, fear or perceived restoration between the three danger conditions. The high social danger scenario was rated as significantly more dangerous and fear-evoking but less restorative than the other two danger scenarios. However this was only found to be the case for those taking the high prospect-refuge walk. For those taking the low prospect-refuge walk, ratings of perceived danger, fear or perceived restoration did not differ between any of the three danger conditions.

These results build on the results of the previous chapter and continue to suggest that a social danger may be so strong that it overrides the effect of prospect-refuge. As a result, it appears to have a far greater negative effect on perceptions in a high prospect-refuge environment than a low prospect-refuge one. This may be because people expect a high prospect-refuge environment to be less dangerous than a low prospect-refuge environment and so the presence of a severe social danger is a more unpleasant surprise resulting in greater detrimental effects. In support of this explanation, Lazarus and Folkman (1984) suggest that unexpected events produce greater distress than expected ones, while there is evidence within the environmental psychology literature to suggest that people have stereotypical behavioural norms for specific environments. For example, Russell and Ward (1982) state that ‘behaviours that occur in one place would be out of place elsewhere’. The results of Leather and Lawrence (1995) suggest that the expectations and perceptions of a public house licensee may be influenced by the surrounding physical environment, with the licensee tending to be perceived as a more aggressive individual, and judged less harshly in a public house that had an untidy bar interior. Lawrence and Leather (1999) built on these findings by demonstrating that people had expectations on the type of licensee based on environmental context, with a licensee running a tidy public house expected to be negotiative rather than confrontational. This collection of work would suggest that people have expectations about an environment and the type of people that frequent them. Situations that oppose these expectations are likely to have a greater effect because they are more salient as they go against the norm. In the case of a country park environment, people are likely to have expectations of a safe, restorative environment used by other people engaged in
recreation. When they are presented with an incongruent situation that differs from these expectations (e.g. another person trying to attack them), the danger has a far greater detrimental impact. Such an incongruent situation is even more of a surprise in a high prospect-refuge environment and because of this and also having more restorative potential to lose than a low prospect-refuge environment, may explain why social danger appears to have a greater detrimental effect in a high prospect-refuge environment.

With the research studies so far having explored and manipulated different types and levels of danger on perceived restoration, the fourth study (chapter 6) was conducted to indirectly test the validity of these findings by examining whether similar results would be found using walks through real environments and using objective established measures of actual restoration. Participants were exposed to either the simulated video walks or took the same walks for real, each walk following completing a cognitively and emotionally depleting task. Using objective measures of actual restoration, the walks through the high prospect-refuge environment were more emotionally, cognitively, physiologically and behaviourally restorative than the walks through the low prospect-refuge environment. In some instances, the walk through the low prospect-refuge actually reversed restoration by increasing negative emotion and further draining attentional capacity. Previous restoration research has typically chosen highly restorative examples of natural environments and compared them with poor examples of urban environments (e.g. Hartig et al., 1996; Ulrich et al., 1991) leading to an almost unanimous expectation that natural environments are highly restorative. The results of this study highlight the danger of this assumption, by demonstrating that not all natural environments are equally restorative and in some instances, may not be restorative at all.

The results using actual measures of restoration are highly consistent with the results of the preceding research studies using perceived restoration measured using Han’s (2003) SRRS. This suggests that people are able to accurately imagine the positive physiological and psychological benefits of a natural environment, providing encouragement for the use of the SRRS to indicate actual restoration. However some significant differences in measures of actual restoration were found between the simulated and actual walks, with the actual walks found to be significantly more cognitively and physiologically restorative. As one would expect, a walk through a real
environment is more immersive and includes the senses of smell and touch. As simulated environments are unable to afford the full realism of an environment, it is unsurprising they are not found to be as restorative. Despite this, the pattern for emotional and behavioural restoration was a little more complicated, with no significant differences having been found. These findings may be partly a result of the simulated walk having being found to be slightly more emotionally and behaviourally restorative than the actual walk in the low prospect-refuge environment. Although the differences were not significant, it meant that even larger and more significant differences in emotional and behavioural restoration were needed between the simulated and field walks specifically within the high prospect-refuge environment to find significant interaction effects. Combining this with a fairly small sample size may explain the unexpected non-significant results for emotional and behavioural restoration.

A number of significant interactions were found between walk type (actual, simulated) and level of prospect-refuge (low, high). Generally speaking, these interactions revealed that the difference in restoration following the walk through the low prospect-refuge environment was not found to be different between the simulated and actual walks. However following the walk through the high prospect-refuge environment, the difference in restoration between the simulated and actual walks was found to be significant, with the actual walk significantly more restorative than the simulated equivalent. This makes sense as once again, the extra sensory information and immersion that one experiences from a real environment should mean it has a greater effect. But why is this only the case in a high prospect-refuge environment? This can be explained by the fact that participants chose to spend significantly longer when walking through the actual high prospect-refuge environment than the simulated counterpart. However when walking through the low prospect-refuge environment, participants chose to spend an equal amount of time walking through the actual and simulated versions. Despite the importance of behaviour in terms of approach/avoidance behaviour in both main theories of restoration (SRT, [Ulrich, 1983]; ART, [Kaplan, 1995; Kaplan & Kaplan, 1989]), to the researcher’s knowledge, this is the first time it has been examined and measured within the restoration literature.
Having conducted four experimental and quantitative experiments, the final study (chapter 7) chose to explore perceptions of danger and the role of the physical structure of the environment using a qualitative framework that could approach the research area from a different perspective. Using a visual card-sorting task, participants were asked to sort 64 photographs of a country park into piles representing danger and restoration. The researcher then got participants to describe and explain their choices by using questions from a semi-structured interview. These responses were then analysed for consistent themes using Interpretative Phenomenological Analysis (IPA). Consistent with Fisher and Nasar’s (1992) typology of prospect-refuge, master themes emerged that highlighted the roles of prospect, refuge and accessibility in perceptions of danger. Prospect appeared to provide a sense of control and forewarning over a threat while refuge was interpreted in one of two ways. In an environment perceived as dangerous, bushes and shrubs tended to perceived as hiding places for potential offenders, while in a safe environment, they were perceived as refuge for the individual. There were also substantial differences in the expectations of the experiences one would have in the low and high danger choices. Sharing some consistency with theories such as Cohen and Felson’s (1979) Routine Activity Theory (RAT), respondents indicated that in the high danger scenes, they would expect to encounter both social and physical dangers while in the low danger scenes, only positive experiences were mentioned. Consistent with both the SRT and ART theories of restoration, several of these experiences made reference to positive changes in emotion, attention, physiology and behaviour. Some interesting responses were also noted in regard to scenes selected as having a high level of danger. Although some respondents stated they felt more likely to be attacked, others felt it would be equally likely to be attacked in their choice of low and high danger scenes. However they felt the low danger scenes offered more control over any danger in terms of greater forewarning and behavioural options such as an unimpeded escape. This was offered as a potential explanation for the finding from the first study that found respondents perceived an equal likelihood of encountering a social danger in either a low, medium or high prospect-refuge natural environment.
8.2 THEORETICAL IMPLICATIONS

From a theoretical perspective, the relationships between the key variables investigated needed to be explicitly stated. Although previous studies have stated relationships between perceived danger and fear (e.g. Herzog & Kutzli, 2002), perceived danger and preference (e.g. Blöbaum & Hunecke, 2005; Fisher & Nasar, 1992; Herzog & Flynn-Smith, 2001; Herzog & Miller, 1988; Nasar & Fisher, 1993) and preference and perceived restoration (e.g. Han, in press; Herzog et al., 2003; Purcell et al., 2001), the relationship between perceptions such as perceived danger and fear on perceived restoration has gone largely unexamined. Although theory and intuition would advocate that perceptions of danger and fear would impede both perceived and actual restoration, relying on such an assumption is dangerous. By exploring the direction and magnitude of the relationships between these different constructs, clear theoretical support for the practical implications of this research can be seen. In addition to supporting the relationships stated by previous research, the strong negative relationships between perceived danger and perceived restoration, and fear and perceived restoration stated in the first research chapter (chapter 3) supports the theoretical expectation that perceptions of danger and fear should be detrimental to the perceived restorative value of an environment. From Ulrich’s (1983) SRT perspective, restoration requires a calming environment devoid of stress that facilitates the replacement of negative emotion by positive emotion. Perceptions of danger typically evoke stress and the process would invariably be disrupted. In ART (Kaplan, 1995; Kaplan & Kaplan, 1989), the recovery of attentional fatigue requires amongst other things, a setting that is compatible to restoration. If it is not, the individual has to direct attention to overcome the incompatibility and this would disrupt the restoration process. In dangerous situations where one feels unable to cope, effortful attention would be directed on tasks such as vigilance and trying to figure out what to do (S. Kaplan, 2001). The consistent pattern that walks that receive the highest ratings of perceived danger and fear also receive the lowest ratings of perceived restoration and vice-versa further support the idea that an absence of perceiveable danger is paramount for perceptions of restoration. An absence of danger not only offers an emotional, cognitive and physiological restbite that facilitates
restoration, but gives people the behavioural freedom to explore and interact with an environment which is an integral part of both main theories of restoration.

Of particular interest is the findings that fear had a stronger negative relationship with perceived restoration than perceived danger did. This supports the clear conceptual distinction between the two constructs and suggests that it is the negative emotional reaction of the perception of danger rather the cognitive appraisal of it that damages perceived restoration the most. Gabriel and Greve (2003) suggest that fear must always be accompanied by a perception of danger whereas danger may not always be accompanied by fear. As Kaplan and Talbot (1983) state, danger can sometimes be attractive (e.g. extreme sports, Loeffler, 2004) whereas fear represents an extreme negative reaction that is typically perceived as dangerous, overpowering and a threat to survival. This is clearly counter to the restoration process and because fear and stress tend to be highly positively correlated (Brannon & Feist, 1997), fear will almost invariably prevent restoration by increasing rather decreasing stress. Within a natural environment, overcoming physical challenges that are likely to be perceived as dangerous have been shown to result in some positive emotional and physiological outcomes (e.g. Kaplan & Talbot, 1983). Because fear can be regarded as a more detrimental and extreme negative construct than perceived danger, from a practical perspective, these results could be interpreted as suggesting that the prevention of fear should take a greater precedence over preventing perceptions of danger in order to protect the restorative potential of an environment as it is fear that has the greatest detrimental effect. It is also worth noting that both the perceived and actual restorative value of a natural environment such as a country park may vary during different times of day. For example, Fisher and Nasar (1992) have demonstrated that fear intensifies after dark and so a fear-evoking threat or danger is more likely to have a larger detrimental effect on preference and restoration in the evening than it does during the day. Although restoration within the dark may be questionable as people are unlikely to be in natural environments such as country parks at night, they may still be visitors at times when it starts to get dark. At times such as these the presence of a fear-evoking danger or threat may have a greater impact than at brighter times of the day.
Important theoretical implications regarding the effect of different types of danger are also raised by this research. Despite a fairly large body of research highlighting a variety of dangers that may be potentially present or encounterable within a natural environment such as a country park (e.g. Bixler & Floyd, 1997; Burgess, 2004; Coble et al., 2003; Kaplan & Talbot, 1983), very little existing research has attempted to make these distinctions. The results from the research studies in this thesis clearly demonstrate that the threat of different types of danger has different effects on both positive and negative perceptions of a country park environment. Furthermore, variations in prospect-refuge have different effects on the perception of these different types of danger. Of the dangers explored, social danger appears particularly detrimental to the positive perceptions one may typically derive within a natural environment. The perceived likelihood of encountering a social danger was found to share negative relationships with both preference and perceived restoration while a simulated walk through a country park with a social danger threat manipulation was significantly more detrimental to these perceptions than either a physical or lost danger threat manipulation. This appears to be as a consequence of a social danger threat being perceived as more likely to be encountered and more severe than either a physical danger or lost danger threat. The imagined presence of a severe social danger was also found to correspond with markedly lower ratings of perceived restoration than in the absence of such a danger or even a more moderate social danger. This shares a high level of concordance with the limited amount of existing research that has differentiated between different sources of danger. Unlike responses to physical danger, to the researcher’s knowledge, no existing research has documented positive responses to incidents of social danger in a natural environment. Indeed Herzog and Rector (2009) demonstrated that the imagined presence of a serious social danger dramatically damaged the perceived restorative potential of an environment. This makes theoretical sense because a social danger typically represents a direct threat to survival. From an evolutionary perspective such as Wilson’s (1985) biophilia, such severe dangers cannot be an enjoyable and positive experience.

However the way in which the imagined presence of a more ambiguous social danger such as an individual being aware of someone walking behind them appears no
more detrimental in terms of fear or perceived restoration than in the absence of any specified danger, particularly when in a high prospect-refuge environment (chapter 5). Presumably people expect other people to visit and walk through such environments because they are perceived as safer and have more restorative benefits. The responses from the qualitative study (chapter 6) support this. As a result, people are not suspicious of the presence of others despite the potential for such a danger to escalate into a more severe one. Conversely in a low prospect-refuge environment, people are suspicious of others because as Micheal et al. (1999) state, such places are conducive to criminal activity because vegetation affords concealment for criminal activity.

The results suggest that both the threat and the imagined presence of a severe social danger appear to override the mediating role of prospect-refuge. This results in social danger appearing to have a far greater negative impact in terms of perceived restoration within a high prospect-refuge environment than it does a low prospect-refuge environment (chapter 5). From a theoretical perspective, this may be because a high prospect-refuge environment is supposedly a less dangerous and more restorative environment. The presence or even threat of a social danger is such an unpleasant surprise that it has a disproportionately larger effect on perceived restoration than in a low prospect-refuge environment where such a threat or danger is more expected not only because it has more restorative potential to lose, but also because the physical structure of the environment is better equipped to harbour such a danger. As discussed later within the practical implications section, this renders the provision of high prospect-refuge natural environments as somewhat of a double-edged sword.

In support of Herzog and Smith (1988) who found that only social and not physical danger was a significant negative predictor of preference, the effect of physical danger on positive perceptions such as preference and restoration within a country park environment appears far more moderate. Results from chapter 3 found the perceived likelihood of encountering a physical danger failed to be a significant predictor (negative) of either preference or perceived restoration. Moreover it also failed to be a significant (positive) predictor of fear. Even the manipulated threat of physical danger appeared to have little effect on the perceptions of a simulated walk through a country park. Although perceived as more dangerous than in the absence of any threat, a
physical danger threat from either being attacked by an animal or injuring oneself as a result of tripping over obstacles was no more feared or less preferred. Although the threat of injuring oneself from tripping was perceived as less restorative than in the absence of a specific threat, the threat from being attacked by an animal was not.

Overcoming physical challenges and obstacles within natural environments may result in positive as well as negative emotions (e.g. Kaplan & Talbot, van den Berg & ter Heijne, 2005). Assuming that emotion works on either a unipolar or bipolar scale, these positive emotions may dilute negative ones such as fear. Furthermore, the idea of biophilia suggests that humans have an innate disposition for contact with nature. Animals, obstacles and physical challenges are an inherent part of nature and so maybe part of the human need for contact with nature involves mastering it and confronting the more moderate dangers and challenges they reside within it. The second research study (chapter 4) used wild boar as an example of a realistic and potentially dangerous animal that could be encountered during a walk through a natural environment such as a country park. Despite wild boar having been reported to attack and injure humans within the United Kingdom, it appears probable that they are not as dangerous or fear-evoking than some other animals or creatures. The choice of animal for the physical danger threat was difficult given that the United Kingdom does not have any native predators. McNally (1987) states that fears of snakes, spiders and other pretechnical objects are overrepresented amongst the population indicating that humans have become biologically prepared to respond with fear and avoidance behaviour to natural stimuli that threatens survival. Therefore within other countries that have predators or venomous snakes and spiders, it is probable that using such creatures in a danger threat manipulation may have a far greater impact, particularly on perceptions of danger and fear. We may also expect such manipulations to have a negative effect on preference and perceived restoration given the relationships between these constructs.

Existing research has shown the thought of becoming lost in a natural environment is a very real and potentially fear-evoking danger (e.g. Bixler & Carlisle, 2004; Coble et al., 2003; Kaplan & Talbot, 1983). In support of this, the first research study (chapter 3) found the perceived likelihood of becoming lost to be a significant positive predictor of fear. It also appears damaging to positive perceptions of a country
park, being significant negative predictors of both preference and perceived restoration. However in response to a heightened manipulated threat of becoming lost, the effects on perceived danger, fear, preference and perceived restoration were far more marginal. Contrary to sources of social and physical danger, becoming lost is a danger that is not forced upon the individual and tends to build up over time. It is also rather more subjective in nature, with different people having different thresholds of what constitutes being lost. Although thresholds of what constitutes social and physical danger may also be partly subjective in nature, the danger of becoming lost appears particularly subjective and so the knowledge that other people have become lost within an environment has far less of an effect.

The distinction between different types of danger raises an important theoretical implication regarding the comparability in terms of fear and the likelihood, severity and perceived control over the different types of danger. For example, regardless of the physical structure of a country park environment, tripping over an obstacle such as an exposed tree root is likely to have a greater likelihood of occurrence than being attacked by another person. However being attacked by another person is likely to have a far greater severity in terms of harm to an individual than tripping over. As already noted in chapter 4, differences in perceived control over different types of danger may also exist, with some dangers being forced upon an individual (e.g. physical and social danger), while others such as becoming lost, may build up and be more under the control of the individual. Differences in the summated elements of danger for each specific type of danger further highlights the importance of making the distinction between different types of danger as they are unlikely to be perceived as equally dangerous and consequently, fear arousing. This means that some dangers are inherently more dangerous than others, and may explain why they have a more detrimental effect on perceptions of an environment. As has already been discussed, the incongruence of a particularly fear-evoking danger within a country park may also magnify its effect on an individual’s perception of the environment. However the lack of equivalence between different types of danger should not be regarded as a limitation because although it restricts direct comparisons being made between dangers, they can be explored independently along with an exploration of the role that the physical structure of the
environment can play in the perception of each type of danger. The results in this thesis clearly demonstrate this, with variations in the physical structure of a country park environment resulting in significantly different perceptions in response to a physical danger threat or in the absence of any specific threat, but no significantly different perceptions in response to the perceived likelihood, manipulated threat of, and imagined presence of social danger.

Previous research using Fisher and Nasar’s (1992) typology of prospect-refuge has been largely confined to urban environments such as alleyways and university campuses (e.g. Fisher & Nasar, 1992; Nasar et al., 1993; Nasar & Jones, 1997; Petherick, 2000/2001; Wang & Taylor, 2006). Although some of these studies within university campuses have utilized park-like spaces, these still remain examples of natural spaces within an urban environment (e.g. Nasar et al., 1993; Nasar & Jones, 1997; Petherick, 2000/2001). Some research has been conducted within more natural environments such as forest settings and has demonstrated that variables that contribute to visibility and locomotor access tend to be positively related to perceived danger and fear but negatively related to preference (e.g. Chapin, 1991; Herzog & Kirk, 2005; Herzog & Kropscott, 2004; Herzog & Kutzli, 2002). However the explicit application of Fisher and Nasar’s (1992) typology to explore perceptions within a natural environment is a novel approach. The research conducted extends the application of the typology to both simulated and field versions of actual walks within a clearly defined natural environment. It also extends the typology to explain differences in both perceived and actual restoration which to the author’s knowledge is something that has not been done before and yields important practical implications which are discussed later. Of particular theoretical interest is the role of refuge within natural environments. Contrary to Appleton’s (1975) perspective, Fisher and Nasar (1992) regard refuge as a negative feature, interpreting it as a hiding place for a potential threat rather than a hiding place for the individual. Given that the threat of being attacked by another person (e.g. Coble et al., 2003; Henderson & Bialeschki, 1993) or an animal (e.g. Bixler & Floyd, 1997; van den Berg & ter Heijne, 2005) are both frequently reported concerns when in a natural environment, the researcher felt that Fisher and Nasar’s (1992) definition of refuge was more appropriate. The results from the research studies conducted as part of
this thesis are encouraging for Fisher and Nasar's (1992) interpretation and applying the
typology to natural environments to explain differences in perceptions of danger, fear,
preference and restoration. There is evidence from qualitative responses from the final
research study (chapter 7) to suggest that whether refuge is interpreted as a hiding place
for a threat or a hiding place for the individual is dependent on the degree of prospect
one has. In an environment where there is a high level of prospect, refuge appears more
likely to be perceived positively. This is because one has greater forewarning of a danger
and can react by using refuge to hide. However in an environment where there is little
prospect, there is no forewarning of a danger and refuge may be used as a hiding places
for a threat to lurk or wait for a potential victim. This has important theoretical
implications regarding the concept of mystery given the clear interrelatedness of refuge
and mystery. Herzog and Miller (1998) define mystery as the promise of further
information from penetrating more deeply into a setting. Features that enhance mystery
include curving pathways, vegetation, partial concealment and shadows (cf. Herzog &
Miller, 1998). Mystery appears to have an extremely paradoxical role, having been
shown to be a positive predictor of both preference (e.g. Herzog, 1989; Kaplan &
Kaplan, 1989) and perceived danger (e.g. Fisher & Nasar, 1992; Nasar & Fisher, 1993;
Schroeder & Anderson, 1984). The results from the research conducted here suggests
that like refuge, the way in which mystery is perceived is dependent on other situational
factors such as prospect and whether one expects a threat to be present in the
environment.

A final theoretical implication that warrants consideration is the role of company.
Like the vast majority of research studies conducted within the restoration area that have
used both simulated and field walks, the research conducted as part of this thesis adopted
a methodology where respondents and participants were either asked to imagine or
actually completed taking walks through a country park alone. Although many people
walk through such environments alone, they are also places to visit and engage in social
contact with family and friends. It was felt that including the manipulation of social
context in addition to different types of danger and prospect-refuge was too much for
one thesis to pursue, resulting in it focusing on the effect and perceptions of danger
when walking through these environments alone. Of the limited research that has
explored the role of company in restoration, Staats and Hartig (2004) found two opposing effects prevented a main effect of company on preference and perceived restoration being found. Company was found to enhance restoration when safety was a concern, whilst solitude enhanced restoration when safety was controlled for. These results suggest that people find solitude more effective in restoring attentional capacity than company providing the safety benefits that company may bring is already secured. This corroborates claims that one must be alone in an unthreatening environment for restoration to occur (Kaplan & Kaplan, 1989). Nonetheless the role of company is likely to play some mediating role in the effects of different types of danger on perceptions such as danger, fear, preference and restoration. Walking with a family member or friend is almost diminish the negative impact of any danger threat as they are likely to be perceived as being a source of assistance should any threat be encountered. However it is unclear how the presence of a stranger would be perceived. Would they be perceived as a potential source of assistance or a source of danger? Given that dangers within natural environments can clearly be detrimental to the positive experiences one typically derives from such environments, exploring the role of company in the perception and effects of dangers appears an interesting line of research for future research to undertake.

8.3 METHODOLOGICAL IMPLICATIONS

The first four research studies in this thesis (chapters 3 to 6) were largely experimental in design and raise some important methodological implications that warrant consideration. Firstly, the opening research study (chapter 3) asked respondents to complete an online questionnaire at the end of a stressful and fatiguing working day. Although we have no evidence to suggest respondents ignored this request, we have no way of being certain that they were stressed and fatigued and that this was similar between conditions. The subsequent research chapters attempted to rectify this by using the POMS-SF (Shacham, 1983) to measure emotion (chapter 4) and an amended PC administered Stroop task to measure attentional fatigue (chapters 5 and 6). The results of the POMS-SF as part of study 2 indicated that respondents were in a fairly negative emotional state conducive to restoration. Because of the similarity in instruction to
complete questionnaires in chapters 3 and 4, it is hoped that this can provide some encouragement that the request of completing the questionnaire at the end of a stressful and fatiguing working day as part of the first research study was followed. The third and fourth research studies (chapters 5 and 6) were conducted within a laboratory setting and used an amended Stroop task that combined colour and shape recognition specifically created to ensure participants were in a mental state conducive to restoration. A pilot test revealed the task was successful in depleting emotion, attention and increasing heart rate. The researcher hopes that this task could prove extremely useful for future restoration studies attempting to induce such mental and physical states prior to experimentation.

A second methodological implication involves the use of an online snowball sampling technique to recruit respondents in the first two studies (chapter 3 and 4). The use of online questionnaires is becoming increasingly prevalent within areas of environmental psychology such as environmental attitudes where perceptions of an environment are measured (e.g. Grønhej & Thøgersen, in press; Milfont & Duckitt, 2004). However unlike the research conducted as part of this thesis, these studies typically do not contain visual stimuli. As respondents completed the questionnaires for chapters 3 and 4 away from a standardized laboratory setting, there was the opportunity for variations in the size and quality of the photographs depicting the simulated walks despite the questionnaire standardizing size and resolution. Although the vast majority of PC monitors and laptop screens are capable of presenting the photographs as intended, this should be acknowledged as a potential limitation. Although there is no evidence to suggest that respondents ignored the instructions to complete the online questionnaires in the absence of any distractions, we have no way of knowing this for certain and so this should also be acknowledged as a potential limitation. However on a positive note, the findings of the first two research chapters that used online questionnaires (chapters 3 and 4) did reflect the findings of the laboratory and field based studies (chapters 5 and 6) and once again, it is hoped they can provide some encouragement towards the methodology adopted for the first two research studies (chapters 3 and 4).
Thirdly, despite simulation techniques receiving widespread use within the environmental psychology literature (cf. Stokols, 1993), some may question the ecological validity of such techniques. However given that a substantial proportion of the research conducted as part of this thesis involved some manipulation of danger or threat, ethical guidelines prevented exploring the research area within a field environment. The first two research studies (chapters 3 and 4) used a sequence of twelve photographs to simulate examples of real walks through a country park. In addition to the absence of senses such as smell and touch, the use of sequential slides or photographs to depict a walk prevents movement within or across separate slides and walking concerns moving in an environment (e.g. Heft & Nasar, 2000). Similarly to existing research (e.g. Staats et al., 1997), descriptions of the walk were included to help mitigate this issue and help respondents better imagine taking the walk for real. The descriptions made indirect reference to levels of prospect, accessibility and hiding places by describing physical features such as light, vegetation, obstructions and pathways of the environment. It is hoped that this provided some improvement on a simulation technique that has proved extremely popular in existing studies of environmental preference and restoration (e.g. Purcell et al., 2001 Staats & Hartig, 2004; Ulrich et al., 1991). The third and fourth studies (chapters 5 and 6) attempted to use a more realistic and immersive simulation technique using videos of walks as environmental stimuli. It was hoped that this would improve ecological validity and produce a greater chance of finding significant effects. In addition to providing additional elements such as sound and movement, the videos were presented on a far larger and immersive scale. De Kort et al. (2006) demonstrated that a more immersive projection of a mediated natural environment using a larger screen had stronger stress reducing effects on physiological measures such as heart rate and skin conductance than a less immersive projection. The results of the fourth research study described in chapter 6, comparing restoration following exposure to simulated video walks with their actual counterparts do suggest that unsurprisingly, walking through a real version of a country park is more restorative than a simulated version of it. However this only appears to be so for a high prospect-refuge environment. From a methodological perspective this would suggest that in a highly restorative environment, using a simulation method such as a video of a walk
cannot fully encompass the full restorative benefits of an actual environment. The results imply that this may be possibly due to restricting people from having the full behavioural freedom they want to explore an environment. However within a less restorative environment, a simulated walk may be more representative of the true restorative value of an actual environment, possibly as a result of people not wanting to explore the actual environment any more than is depicted in the simulated version of it. Although the use of simulated walks may not fully encompass the full restorative benefits of an environment, such techniques only make it harder to detect significant effects. Theoretically, it may also be possible that the presence or even threat of a fear-evoking danger may be reduced in a simulated version of an environment as opposed to the actual environment because of the reduced realism that a simulation provides. This may consequently result in a simulated environment being perceived as more restorative and preferred than the real environment actually is. However because ethical considerations prevented the use of manipulating the threat or presence of specific dangers within a real environment, simulation techniques had to be adopted, making this preposition is incredibly difficult to test. Given these restrictions, the congruence of the effect of prospect-refuge on restoration between simulated and actual walks in addition to the use of descriptions to help emphasize the physical environment, the researcher feels adequate simulations were devised to explore the research area.

A further important methodological issue regarding ecological validity involves the results of the second research study (chapter 4) and the manipulation of danger threat, namely, how realistic are wild boar as examples of a potentially fear-evoking physical danger in the English countryside? With a growing population coinciding with media reports of wild boar attacks on horses, dogs and even humans, it would suggest that wild boar could be considered a real and potentially encounterable source of physical danger (BBC, 2008). Furthermore reports that large areas of grassland, including picnic areas in the forest, have also been churned up by wild boar which would provide further evidence of their potential presence to visitors of the English countryside (BBC 2008). Despite this, it must be conceded that wild boar do not represent a major threat to human survival that is likely to evoke high levels of fear, nor are they a particularly common danger in this or indeed any country park in the United
Kingdom. However as respondents were not asked for their perceived likelihood of being attacked by wild boar, we are unable to make firm conclusions regarding the ecological validity of such a danger. As stated in the literature review, work by Öhman and colleagues suggest that humans have developed an evolutionary fear of snakes and spiders. The only venomous snake indigenous to the United Kingdom is the adder and although it may not represent any more severe threat to human survival than wild boar, the evolutionary connection of snakes with fear and the greater adder population means that the adder may have been a better choice of a fear-evoking physical danger in the English countryside than wild boar. As has been stated, the relative safety of the English countryside from predators and dangerous animals make the selection of physical danger stemming from an animal a difficult one. Although in hindsight, wild boar may not have been the most ecologically valid choice of physical danger because it is relatively uncommon, this thesis makes a valuable initial contribution in distinguishing between different sources of danger that could be potentially encountered in a natural environment within the United Kingdom.

A fourth methodological implication involves the measurement of restoration. The majority of the research conducted as part of this thesis focused on perceived restoration and the restorative potential of different walks through a country park rather than actual restoration physically taking place within the human body. This was largely because of the experimental design of the research using simulations, manipulating danger and needing a convenient measure for use in online questionnaires. Measuring perceived restoration has become increasingly prevalent for simulation techniques within the restoration literature, typically demonstrating a high level of consistency and congruence with actual measures of restoration (e.g. Herzog & Rector, 2009; Purcell, Peron & Berto, 2001; Staats & Hartig, 2004; Staats et al., 2003; Tennegart & Hagerhall, 2004). Han’s (2003) SRRS was chosen over the more established Hartig et al.’s (1997a) PRS measure of perceived restoration throughout this thesis because it focused on restoration in more general terms and because it was felt that the inclusion of a behavioural element was important given expected behavioural consequences of perceptions of danger. This is in addition to both main theories of restoration (SRT and ART) advocating some behavioural element in the form of approach or avoidance.
behaviour. Although the validity and reliability of the SRRS as a measure of perceived restoration has been demonstrated using slides of the six major terrestrial biomes of the world and analyses revealed that (Han, 2003), it has received very little practical use. The results from this thesis regarding its application are encouraging. The scale has consistently demonstrated high levels of internal consistency, an absence of multicollinearity, adequate model fit and that it is sensitive enough to detect differences in perceived restoration between within-environment examples. The congruence in findings with objective measures of actual restoration from the fourth research study described in chapter 7 also suggests that people are able to accurately anticipate the restorative potential of a natural environment and perceptions of restoration made using the SRRS may be considered indicative and valid representations of actual restoration.

In addition to using established objective measures of emotion (ZIPERS), cognition (NCPT) and physiology (heart-rate), study 4 devised and included a novel measure of behavioural restoration. Despite the prominence of behaviour in both SRT and ART, existing fixed duration simulation studies have not sought to measure behaviour. As has already been stated, this inclusion proved extremely useful, with respondents choosing to spend significantly longer walking in both simulated and field versions of a high prospect-refuge environment than a low one. Future studies using simulated walks may like to include such an element as not only does it offer a theoretical and methodological improvement on existing techniques, but it may also yield some valuable results that may help explain other findings.

Because of the largely experimental design needed to address the research area, it was felt that the inclusion of a qualitative research study could help explore the perception and role of danger within a natural environment from a more subjective and ecologically valid perspective. Of the various qualitative techniques possible, the researcher chose to combine a visual card sorting task (VCS) with a semi-structured interview analysed using interpretative phenomenological analysis (IPA) for the final research study (chapter 8). Understanding the categories people use and how they assign concepts to these categories is a very useful way of analysing human cognition (Canter et al, 1985). By getting respondents to first sort a series of photographs into piles according to how dangerous they perceive the environment to be before secondly,
getting them to explain their choices, it allowed the researcher to explore the research area from a different direction. Because the researcher had already chosen the research area and conducted an extensive literature review in addition to several research studies, techniques such as grounded theory could not be used. However the use of IPA seemed appropriate given that the respondents used were regular visitors to natural environments such as country parks and had indicated having significant positive and negative experiences in such environments. Qualitative techniques are extremely complimentary to the more established exploratory quantitative research designs. The researcher feels that utilising the two techniques provides a more ecologically valid and richer picture into the theoretical underpinnings of what is a largely unexplored research area.

8.4 PRACTICAL IMPLICATIONS AND IDEAS FOR FUTURE RESEARCH

In England there are over 270 designated country parks that cover over 38,000 hectares of land. The majority of these country parks are managed and owned by local authorities, located on the rural-urban fringe and collectively receive an estimated 73 million visitors per year (Countryside Agency, 2004). In 2000, the Countryside Agency launched their programme for the ‘renaissance’ of country parks and the UK Forestry Commission is even seeking to develop more wooded areas on the urban fringe and old brownfield sites. With the Forestry Commission’s ‘Active Woods’ campaign and government attempts to promote recreation within natural environments to promote healthier lifestyles, designing wooded areas in country parks in a manner that maximises their restorative benefits is therefore extremely important. The results from the research studies conducted as part of thesis suggest that adopting Fisher and Nasar’s (1992) typology of prospect-refuge as a potential design framework could be one way of helping achieve this. Ensuring that country parks contain walks that offer a high degree of prospect and ease of movement but a low number of hiding places for threats generally appears to reduce negative perceptions such as perceived danger and fear, but maximise positive perceptions such as preference and both perceived and actual restoration. In the absence of any specific danger or threat, the typology appears
extremely useful. It also appears extremely useful in minimising perceptions of danger and fear, but maximising preference and perceived restoration in response to a physical danger threat stemming from an animal or from injury resulting from tripping or falling over obstacles. However when walking through a country park where one could be attacked by another person, variations in prospect-refuge do not appear to have any discernable impact. Given that the perceived likelihood of encountering a social danger on a walk through a country park appears to have positive relationships with perceived danger and fear but negative relationships with both preference and perceived restoration, it is this type of danger that threatens to reduce the benefits that contact with nature typically affords. Even in the imagined presence of being followed by a stranger, variations in prospect-refuge according to Fisher and Nasar’s (1992) typology does not appear to result in differences in perceived danger, fear or perceived restoration. Rather than focussing on how the physical structure of the environment can influence the perception of social danger, it may be more rewarding to focus on combating the perception of social danger in natural environments itself.

It is important to remember that Fisher and Nasar’s (1992) typology only appears negligible rather than counterproductive in minimising negative perceptions and maximising positive perceptions in response to either a social danger threat or imminent encounter of social danger. Given that the vast majority of walks through natural environments such as country parks pass by without any specific threat or danger, using the typology as a potential design framework appears one way of trying to maximise the positive experiences and benefits for visitors. Furthermore encouraging high prospect-refuge country parks appears to help overcome the damaging effect on restoration from the threat of personal injury as a result of tripping over obstacles. Given that we live in a time of escalating health care costs, increasing mental health problems amongst the population and declining environmental quality (Hartig et al., 2003), it is imperative that the benefits of contact with natural environments such as country parks are made the most of to help ensure that the public health strategies that they are incorporated in are successful. Environmental planners and designers may therefore like to consider Fisher and Nasar’s (1992) typology of prospect-refuge when designing natural environments such as wooded areas in country parks.
The research studies conducted as part of this thesis consisted of an entirely student sample which may raise questions as to the generalisability of these results. An extensive meta-analysis of landscape preference assessments by Stamps (1999) found a strong positive correlation \(r = .83\) between student and non-student samples. This would suggest that the use of a student sample can be considered an accurate representation of the population they are taken from. However, some previous studies investigating landscape preference have found some significant differences in ratings as a function of age, gender and previous exposure to an environment (e.g. Lyons, 1983). From an empirical standpoint, it therefore made sense to make the research studies conducted to be comparable with each other, using similar homogenous samples in terms of age, gender and experience of visiting country parks.

University students may actually be a very useful group to study because there has been a dramatic increase in mental health and severe psychological problems among college students over the past decade (for a review see Kitzrow, 2003). Furthermore, college students, especially freshmen, are a group particularly prone to stress (D'Zurilla & Sheedy, 1991). Therefore, students represent a group where the restorative effects of nature could prove highly beneficial. Responses from the research studies in this thesis also indicated that the vast majority of respondents had experience of visiting country parks. Although students appear to be representative of the population, they tend to be fairly restricted in terms of demographics such as age and socio-economic status.

Despite Stamps (1999) claiming that there is a very high degree of consensus in environmental aesthetics for many demographic distinctions, future research may like to explore the research area with different sample populations. For example, a tendency has been found for elderly people to prefer more managed natural environments over wilder ones with less discernable human influence (e.g. Balling & Falk, 1982; Strumse, 1996; van den Berg & Koole, 2006; van den Berg et al., 1998). This may be as a result of elderly people being more physically vulnerable in wilder environments or may reflect generational differences in culture and upbringing.

In addition to exploring the role of gender, social context and other specific types of natural environment already mentioned, future research may also like to extend the practical implications of understanding perceptions of danger and the role of the
physical structure of a country park with other types of environment user. For example within country parks, dog walking is extremely popular. Cutt, Giles-Corti, Knuiman and Burke (2007) state that it is likely that physical features of the natural environment that support people walking in general also support people walking their dog. They also claim that published research on the physical features of environments that are conducive to walking with a dog in public have been few and far between. Country parks are also regularly used by people engaging in recreation including cyclists and runners. From a practical and policy perspective, understanding the experiences and perceptions of danger within country parks by such regular visitors is extremely important.

8.5 CONCLUSION

Contact with nature has long been regarded as therapeutic with exploring and engaging with such environments resulting in a number of psychological and physiological benefits including restoration. But nature also harbours a dark side, containing a range of dangers and threats from a variety of sources that one may expect to be detrimental to the positive experiences and perceptions derived from contact with nature. The research conducted as part of this thesis attempted to explore the different types of danger that people may perceive in a natural environment on perceptions of such an environment and actual restoration. The mediating role that the physical structure of the environment has on the effects of different types of danger on these perceptions and restoration was also explored.

The major findings from the research demonstrate that perceiving danger does not always heighten negative perceptions and diminish positive perceptions of a natural environment. The perception or threat of a danger that evokes most fear appears most detrimental to positive perceptions of an environment such as preference and restoration. Of the different dangers investigated, it is the threat of being attacked by another person that has the greatest effect on perceptions of restoration and preference. It is perceived as more severe and likely to occur than other dangers including being attacked by an animal, tripping over obstacles or becoming lost. Having someone follow you through a
natural environment also results in far more negative perceptions than if you were not being followed. These findings are theoretically important because they not only demonstrate that specific dangers may result in natural environments losing their restorative potential, but also clearly highlight the differences between different types of danger. At the moment there is very little research examining the effects of danger within natural environments on people’s perceptions of the environment. Of this limited research, even less has made the distinction between different types of danger. The research presented here demonstrates the need for future research in the area to make this distinction as the perception of different types of danger is likely to have at the very least, different effects on fear, restoration and preference for an environment. This then leads on to important practical implications to help protect the physiological and physical benefits that people may expect from such environments by attempting to combat the negative effects of the most detrimental types of danger. One way of doing this could be through the physical structure of the surrounding environment.

The results demonstrate that the perception of danger stemming from nature itself and becoming lost can be influenced by the physical structure of the surrounding environment. In these cases and in the absence of any specific danger, a natural environment which provides clear views into an environment (prospect), is more accessible and passable (accessibility) and has few hiding places (refuge) is perceived as less dangerous, evokes less fear and is more preferred and perceived as more restorative than an environment low in prospect and accessibility but with a high number of hiding places. This is the same for environments where no specific danger or threat is present as well as for environments in which there is the danger of being attacked by an animal or from tripping over obstacles. However these differences in the physical structure of the environment have no discernable effect on the perceived likelihood of being attacked by another person. Moreover there is no difference in the environment’s perceived restorative value if there is a threat of being attacked or of being followed by a stranger. Such threats or dangers appear detrimental to experiences in any environment, particularly in environments high in prospect and accessibility and with a low number of hiding places. This is extremely interesting as it goes against a substantial body of research in largely urban areas where the threat of being attacked by another individual
is particularly prominent. Such research has found an environment is perceived as less
dangerous and more preferred if it contains high prospect and accessibility with a low
number of hiding places. This implies that conventional approaches regarding
environmental design that have developed in urban environments to counter the threat of
being attacked by another person may not prove overly successful when applied to
natural environments. Perhaps this is because the threat of encountering such dangers is
likely to be perceived as significantly less in a natural environment as opposed to an
urban one.

People appear able to accurately perceive the physiological and psychological
benefits that an environment actually provides with existing research demonstrating a
very high level of congruence between actual and perceived measures of restoration.
Given this and that the perceived likelihood of being attacked by another person is
particularly damaging to positive perceptions such as preference and restoration, people
are likely to have less positive perceptions, derive less positive experiences and are more
likely to avoid natural environments that become associated with such dangers. The
important message here is that other avenues to minimise the perception, association and
effect of this type of danger need to be explored to help protect the positive perceptions
and health benefits of contact with nature.

However one must remember that the vast majority of encounters walking
through such environments are not associated with nor contain such a danger. In the
absence of any specific danger or threat, the results show a high level of prospect and
accessibility natural environment combined with a low number of hiding places appears
successful in managing both negative and positive perceptions of both real and
simulated walks through a natural environment. Environmental planners may therefore
want to consider using such features as a potential framework when designing and
managing such environments. With the increasing prevalence of mental and physical
health problems within the population, natural environments such as country parks that
can facilitate good health and well-being through benefits such as restoration are
extremely valuable. It is therefore imperative that perceptions towards these
environments and the benefits they provide are maximised to ensure the effectiveness of
any public health strategies they may be incorporated in. The research conducted as part
of this thesis goes someway into trying to understanding the dangers that may reduce the restorative value of such environments and how the physical structured of the environment can be designed to counter it.
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APPENDICES

APPENDIX A - WALK DESCRIPTIONS FROM CHAPTERS 3 & 4

NB. All 3 descriptions used for study in chapter 3. Only low and high prospect-refuge descriptions used for studies in chapter 4.

Low prospect-refuge

You are taking a short walk alone through a country park. You have entered a dense forest-like area that is becoming wilder and less well kept. The tall trees block out the sun making it darker. The undergrowth and overhanging branches from the trees are blocking your views further into the forest. There is no obvious trail and you really have to find your way past fallen branches and other obstructions that make the area difficult to walk through. It is hard to see clearly ahead and back where you have come from.

Try to imagine how you would feel if you were walking through the area that is shown.

Medium prospect-refuge

You are taking a short walk through a country park. You have entered a forest-like area that is fairly wooded and has some wild vegetation. Most of the sunlight is able to reach ground level making the area fairly light. Some of the undergrowth and overhanging branches from the trees are blocking your views further into the forest, but you can see relatively clearly into the foreground. Although there are some fallen branches and knee high vegetation, walking and navigating your way around is not that difficult because much of the area contains several paths that wind their way through the forest.

Try to imagine how you would feel if you were walking through the area that is shown.

High prospect-refuge

You are taking a short walk alone through a country park. The walk takes you through several clearings and lightly wooded areas where there are a few isolated trees and only light vegetation that appears well kept. The sunlight is able to reach ground level and the areas are fairly light. You have a clear field of vision and can clearly see into the area around you. Walking and navigating your way around is not difficult; there are several paths that are easy to follow and there are no obstructions that you have to navigate around. You can also see clearly ahead and back where you have come from.

Try to imagine how you would feel if you were walking through the area that is shown.
APPENDIX B – SPIELBERGER (1975) STA-I INVENTORY USED IN CHAPTER 3

A 4-point scale was used to answer the following 20 items used to measure trait anxiety:

1. I feel pleasant. (-)  
2. I tire quickly. (+)  
3. I feel like crying. (+)  
4. I wish I could be as happy as others seem to be. (+)  
5. I am losing out on things because I can’t make up my mind soon enough. (+)  
6. I feel rested. (-)  
7. I am calm, cool, and collected. (-)  
8. I feel that difficulties are piling up so that I cannot overcome them. (+)  
9. I worry too much over something that really doesn’t matter. (+)  
10. I am happy. (-)  
11. I am inclined to take things hard. (+)  
12. I lack self-confidence. (+)  
13. I feel secure. (-)  
14. I try to avoid facing a crisis or difficulty. (+)  
15. I feel blue. (+)  
16. I am content. (-)  
17. Some unimportant thoughts run through my mind and bother me. (+)  
18. I take disappointments so keenly that I can’t put them out of my mind. (+)  
19. I am a steady person. (-)  
20. I get in a state of tension or turmoil as I think over my recent concerns and interests. (+)  

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APPENDIX C – SOCIAL DANGER SCENARIOS AND WALK DESCRIPTIONS FROM CHAPTER 5

Low Prospect-Refuge + No Danger

You feel fatigued and your attention feels drained, so decide to take a walk through a country park. The walk takes you to a nature trail through the country park and you enter a dense forest-like area that is becoming wilder and less well kept. The tall trees block out the sun making it dark around you whilst the undergrowth and overhanging branches from the trees are blocking your views further into the forest. There is no obvious trail and you really have to find your way past fallen branches, tangled vegetation and other obstructions that make the area rather difficult to walk through. It is hard to see clearly ahead and back from where you have come from. However it is very quiet as you walk through the area and you can hear leaves rustling in the slight breeze and birds chirping.

The video you are about to see shows the remainder of this walk.

Low Prospect-Refuge + Moderate Danger

You feel fatigued and your attention feels drained, so decide to take a walk through a country park. The walk takes you to a nature trail through the country park and you enter a dense forest-like area that is becoming wilder and less well kept. The tall trees block out the sun making it dark around you whilst the undergrowth and overhanging branches from the trees are blocking your views further into the forest. There is no obvious trail and you really have to find your way past fallen branches, tangled vegetation and other obstructions that make the area rather difficult to walk through. It is hard to see clearly ahead and back from where you have come from.

Whilst taking the walk, you pause for a quick break and glance back to see where you have come from. In this distance, you can see another person walking along the path you have taken towards you. They don’t seem to have noticed you and keep walking along. You make several short breaks from your walk and glance back each time. The person seems to be walking behind you along a similar route but remain some way behind you and do not seem to be getting closer. You cannot hear their footsteps, leaving you to concentrate on negotiating your way through the trail.

The video you are about to see shows the remainder of this walk.

Low Prospect-Refuge + High Danger

You feel fatigued and your attention feels drained, so decide to take a walk through a country park. The walk takes you to a nature trail through the country park and you enter a dense forest-like area that is becoming wilder and less well kept. The tall trees block out the sun making it dark around you whilst the undergrowth and overhanging branches from the trees are blocking your views further into the forest. There is no obvious trail
and you really have to find your way past fallen branches, tangled vegetation and other obstructions that make the area rather difficult to walk through. It is hard to see clearly ahead and back from where you have come from.

On several occasions during the walk, you have heard the sound of footsteps stepping on the undergrowth behind you. You glance back behind you but cannot see anyone, however these sounds are becoming increasingly louder and frequent. Every time you stop to glance back, these sounds disappear. The latest time you glance back, you see the shape of a person 20 meters behind you through the trees who seems to be looking towards you. When you resume walking, you hear the footsteps resume. It seems you are being followed.

The video you are about to see shows the remainder of this walk.

**High Prospect-Refuge + No Danger**

The walk takes you through several clearings and lightly wooded areas where there are only a few isolated trees and small patches of light vegetation that appears tidy and well kept. The sunlight is able to reach ground level and the areas are light. You have a clear field of vision and can clearly see into all the area around you. Walking and navigating your way around is not difficult; there are several paths that are easy to follow and there are no obstructions that you have to navigate around. You can also see clearly ahead and back where you have come from. It is very quiet as you walk through the area and you can hear leaves rustling in the slight breeze and birds chirping.

The video you are about to see shows the remainder of this walk.

**High Prospect-Refuge + Moderate Danger**

The walk takes you through several clearings and lightly wooded areas where there are only a few isolated trees and small patches of light vegetation that appears tidy and well kept. The sunlight is able to reach ground level and the areas are light. You have a clear field of vision and can clearly see into all the area around you. Walking and navigating your way around is not difficult; there are several paths that are easy to follow and there are no obstructions that you have to navigate around. You can also see clearly ahead and back where you have come from.

Whilst taking the walk, you pause for a quick break and glance back to see where you have come from. In this distance, you can see another person walking along the path you have taken towards you. They don’t seem to have noticed you and keep walking along. You make several short breaks from your walk and glance back each time. The person seems to be walking behind you along a similar route but remain some way behind you and do not seem to be getting closer. You cannot hear their footsteps, leaving you to enjoy the natural sights and sounds along the walk.

The video you are about to see shows the remainder of this walk.
High Prospect-Refuge + High Danger

The walk takes you through several clearings and lightly wooded areas where there are only a few isolated trees and small patches of light vegetation that appears tidy and well kept. The sunlight is able to reach ground level and the areas are light. You have a clear field of vision and can clearly see into all the area around you. Walking and navigating your way around is not difficult; there are several paths that are easy to follow and there are no obstructions that you have to navigate around. You can also see clearly ahead and back where you have come from.

On several occasions during the walk, you have heard the sound of footsteps stepping on the undergrowth behind you. You glance back behind you but cannot see anyone, however these sounds are becoming increasingly louder and frequent. Every time you stop to glance back, these sounds disappear. The latest time you glance back, you see the shape of a person 20 meters behind you through the trees who seems to be looking towards you. When you resume walking, you hear the footsteps resume. It seems you are being followed.

The video you are about to see shows the remainder of this walk.
APPENDIX D – INTERVIEW SCHEDULE FROM CHAPTER 7

Interviewer (I): In front of you are a series of photographs taken in a nearby country park. What I would like you to do is sort them into as many piles as you wish running from low to high in response to the question: Which photographs do you think represent the most dangerous places to be in?

(Interviewer takes two most extreme piles and arranges them so that all can be seen).
I: Please explain to me why you have chosen these photographs?

I: What are the physical features of the environment shown in the photograph that makes you feel it is/is not a dangerous place to be?

I: How does this make you feel?

I: What are the sort of dangers that you think could you encounter in this sort of environment and how do you think the environments shown in the photos affect these dangers?

I: What sort of people do you think would use these environments? What would they be doing?

(Interviewer takes photographs and shuffles them).
I: What I would like you to do is sort them into as many piles as you wish running from low to high in response to the question: Which photographs represent places that you would prefer to be in following a very busy, stressful day?

(Interviewer takes two most extreme piles and arranges them so that all can be seen).
I: Please explain to me why you have chosen these photographs?

I: How would these places affect your emotions/attention/physiology and behaviour?