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# Health & Place

journal homepage: [www.elsevier.com/locate/healthplace](http://www.elsevier.com/locate/healthplace)

## When walking in nature is not restorative—The role of prospect and refuge

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### ARTICLE INFO

#### Article history:

Received 6 January 2012

Received in revised form

17 December 2012

Accepted 2 January 2013

Available online 9 January 2013

#### Keywords:

Nature

Restoration

Danger

Prospect

Refuge

### ABSTRACT

People tend to recover more quickly from stress and mental fatigue in natural than in urban environments. But natural environments may not always be restorative. Dense wooded areas may evoke fear and stress and require directed attention to avoid getting lost or tripping over. Little is known about the restorative potential of such environments. Two experiments were conducted to examine restoration in natural settings with different levels of accessibility, prospect (clear field of vision) and refuge (places to hide). An on-line survey ( $n=269$ ) examined perceived restoration of environments presented in a slide show. An experiment examined actual restoration in response to walks in a real outdoor setting ( $n=17$ ) and in response to videos of the same walks (in a laboratory;  $n=17$ ). The findings demonstrate that exposure to natural environments with high levels of prospect and low levels of refuge, is indeed restorative. However, exposure to natural environments low in prospect and high in refuge is not, and may even further increase levels of stress and attention fatigue. These findings demonstrate that natural places may not always be restorative places.

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### 1. Introduction

Exposure to natural environments can improve mood, reduce blood pressure and heart activity and improve people's ability to concentrate. The restorative benefits of natural settings (as compared to built settings) is well documented (for reviews see [Bowler et al., 2010](#) and [Health Council of The Netherlands, 2004](#)). However, not all natural environments may be restorative. Dense wooded areas, for instance, may not be restorative as they can evoke a sense of fear of getting lost or being attacked and they may require concentration to find ones way around. The restorative benefits of different types of natural environments, however, has not yet been systematically studied. This paper uses Prospect–Refuge theory ([Appleton, 1975](#)) to examine how the physical structure of a natural environment may enhance or reduce actual and perceived restoration.

In Environmental Psychology 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) 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. Non-threatening natural

environments provide 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. In support of SRT, it has been shown that viewing natural environments fosters faster and greater recovery from physiological arousal than viewing urban environments, for instance, by lowering blood pressure ([Hartig et al., 2003](#)) and heart rate ([Laumann et al., 2003](#); [Ulrich et al., 1991](#)) or by reducing hand sweating and muscle tension ([Ulrich et al., 1991](#)). Moreover, positive changes in self-reported mood tend to be greater during and after exposure to natural environments in comparison to non-natural environments ([Cackowski and Nasar, 2003](#); [Hartig et al., 2003](#); [Ulrich et al., 1991](#)).

[Kaplan's \(1995; Kaplan and Kaplan's, 1989\)](#) Attention Restoration Theory (ART) adopts a cognitive framework to explain the restorative process. Two types of attention are distinguished; directed and involuntary. Directed attention forces the mind to actively engage and focus attention (for instance on a difficult task) even in the presence of more exciting stimuli ([Kaplan and Kaplan, 1989](#)). Like a battery, our directed attention capacity is limited and can be depleted by completing an intense task. ART proposes that our directed attention is best recharged through exposure to a source of involuntary attention. Natural settings are believed to be of particular value for directed attention restoration. This has been supported by several studies ([Hartig et al., 2003](#); [Tennessen and Cimprich, 1995](#); [Berto, 2005](#)).

Both theories suggest that not all natural environments may be restorative. SRT proposes that a restorative environment is one that provides a source of solace and reprieve and is devoid of

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every day stressors. For ART restoration comes from the recovery of directed attention fatigue. An environment that demands directed attention to negotiate it or to keep a look out for threats is unlikely to be restorative (Kaplan, 1995). But to our knowledge the restorative potential of different types of natural environments has not yet been studied systematically.

Very few studies examine the features of restorative environments (Bowler et al., 2010). The vast majority of research on restorative environments compares non-threatening natural environments with stressful built environments (e.g., Berto, 2005; Hartig et al., 2003; Parsons et al., 1998) often in a laboratory setting (e.g., Berto, 2005; Staats and Hartig, 2004; Ulrich et al., 1991—for exceptions see Hartig et al., 1991, 2003; Kaplan and Kaplan, 1989; Roe and Aspinal, 2010). But nature can contain many different sources of stress, danger and threat that may or may not evoke negative reactions. This includes natural threats such as predators, venomous animals and lightning (Tooby and Cosmides, 1990) as well as social threats such as the threat of being attacked by another individual (Burgess, 1998; Coble et al., 2003). Indeed enclosed, dark and dense wooded areas may prove intimidating rather than therapeutic (Milligan and Bingley, 2007). Safety can be a real concern in natural places (Krenichyn, 2006). Fear of being attacked by another person is not uncommon (particularly for women; e.g., Coble et al., 2003; Henderson and Bialeschki, 1993) as is fear of becoming lost (Bixler et al., 1994; Coble et al., 2003; Kaplan and Talbot, 1983) or to step on a snake, trip over a tree, get chased by a swarm of bees or get caught in a thunderstorm (Bixler and Floyd, 1997; Van den Berg and ter Heijne, 2005).

The few studies that examine threat in nature suggest that such threats can evoke both positive and negative emotional reactions. Some people report positive experiences by overcoming sources of physical danger in awe-inspiring nature (Kaplan and Talbot, 1983). Positive responses to wilderness include increased energy, self-confidence and feelings of awe that may lead to deeper thought and reflection on life (Ewert, 1986; Kaplan and Kaplan, 1989; Kaplan and Talbot, 1983). Even fearful encounters in more everyday nature are not always negative (Van den Berg and Ter Heijne, 2005). To what extent such environments are restorative is not known.

The level of prospect (clear field of vision) and refuge (places to hide) in a natural environment may significantly impact on people's experiences in such environments and therefore their restorative potential. Prospect–refuge theory (Appleton, 1975) postulates that humans prefer environments high in prospect and refuge because they afford survival from living hazards by offering early observation and a chance to attain shelter. Appleton (1975) claims that perceived levels of prospect and refuge are determined by physical or symbolic attributes of the environment: “Any feature or 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). Features of both prospect and refuge have been linked to perceptions of danger in urban (Nasar and Fisher, 1993; Nasar and Jones, 1997) and natural environments (Andrews and Gatersleben, 2010; Chapin, 1991; Herzog and Kirk, 2005; Herzog and Kutzli, 2002); although Stamps (2008a, b) found little consistent evidence of the role of prospect–refuge on preferences. Prospect–refuge studies tend to focus on simulated environments and as far as the authors are aware have not studied restoration. Grahn and Stigsdotter (2010), however, suggest that refuge may be one of the most significant variables in restorative environments for stressed individuals.

Appleton defines refuge in terms of hiding places for potential victims. However, environmental features that afford refuge for a potential victim may also act as a potential hiding place for

offenders (Warr, 1990; Hassinger, 1985; Fisher and Nasar, 1992). Fisher and Nasar (1992) created a typology for evaluating an individual's perception of safety including both affordances for victims as well as offenders. Both field research and experimental studies have demonstrated that environments low in prospect and escape for potential victims but high in refuge for potential offenders are perceived as less safe than environments high in prospect and escape for potential victims but low in refuge for potential offenders (Fisher and Nasar, 1992; Nasar and Jones, 1997; Petherick, 2000/2001; Wang and Taylor, 2006).

High levels of prospect and escape combined with low levels of refuge in a natural environment may help a visitor identify potential dangers. Such an environment is likely to be perceived as safer than a similar one with little prospect and escape and high levels of vegetation concealing possible dangers. And this may affect the perceived and actual restorative potential of such an environment. This has not yet been studied in detail. The closest existing research has got to examining how specific physical features of the natural environment impact on restoration is from Staats, Gatersleben and Hartig (1997) who studied the effects of density and accessibility on mood change in a simulated forest hike. They 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 confined to emotion, further investigation into the area is required.

To summarise, natural environments may not always be restorative places. Natural settings with low levels of prospect (clear field of vision) and high levels of refuge (number of hiding places) may not be restorative as they can evoke negative mood (fear for being attacked or worry about getting lost) and may require directed attention (to find ones way around or prevent tripping over). We conducted two studies which examine the role of prospect and refuge on perceived (Study 1) and actual (Study 2) restoration in natural environments. Both studies focused on a country park in the UK. Such parks incorporate a range of different types of natural landscapes. There are over 270 of them in England, covering over 38,000 ha and the majority are located on the rural–urban fringe collectively receiving an estimated 73 million visitors per year (Countryside Agency, 2004). The identification of physical features that enhance or reduce restoration in such natural settings can be valuable for the design and management of parks to ensure they remain restorative and valuable to visitors.

## 2. Study 1

Study 1 examines whether natural environments with high levels of accessibility and prospect and few hiding places are perceived as less dangerous and evoke less fear than inaccessible environments with no clear lines of vision (low prospect) and many hiding places. It also examines whether prospect–refuge affects perceived restoration by affecting perceptions of danger and fear. This first study was conducted in an economic way (a large sample on-line experiment) to provide an initial insight into the relationship between environmental restoration and prospect–refuge.

### 2.1. Respondents and design

Two hundred and sixty nine respondents consisting of students and alumni of a University in the South-East of England were recruited using a snowball sampling technique through social networking websites (198 female;  $M=22.48$  years,  $SD=7.84$  years; 18–47 years). Respondents were randomly assigned to one of three simulated environmental conditions that differed in levels of prospect–refuge according to Fisher and

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