

Promoting wellbeing through environment: the role of urban forestry

Abstract

Many of us feel intuitively that having access to nature in urban environments is important for our quality of life. The evidence base supporting this claim has grown considerably in recent years, with high profile studies highlighting the links between access to greenspace/having views of nature and health and wellbeing. Physical activity in green environments is increasingly seen as a valuable treatment for mental health problems and a buffer against the development of depression and anxiety disorders. This paper explores the existing research and theory on the value of nature in the built environment for the wellbeing of city-dwellers, focusing on the role of urban forestry. It also raises questions about what we still have to learn about these less tangible benefits of urban trees and woodlands.

Introduction

Issues of mental health and wellbeing have become increasingly important in developed countries, where depression and anxiety rates have risen despite increases in living standards and economic growth. Recent years have seen growth in research on the impact of the physical environment on mental health and wellbeing, and trees and woodland are now being promoted as 'nature's health service' (O'Brien, 2005).

This paper provides an overview of the research on the connection between nature and wellbeing, with a focus on urban woodland and trees in the built environment. Evidence on the spatial associations between greenspace and health, and on the benefits of 'green exercise' will be examined. The discussion then moves on to the theoretical basis of these relationships and introduces the field of restorative environments research. The specific role of forests, woodlands and trees in the built environment in promoting wellbeing is then explored, drawing from the international literature on restorative environments. In addition to examining the existing evidence base, the paper also discusses some of the gaps in the research and suggests problems warranting further study.

Spatial associations between greenspace and health

Various studies have demonstrated associations between access to local greenspace and population health and wellbeing. People living in areas with high quantities of greenspace have been found to have better health, as measured using both self-report data from surveys and records of morbidity and mortality rates (Maas *et al.*, 2006, 2009; Mitchell and Popham, 2007, 2008). These associations between greenspace availability and population health are seen even when socioeconomic factors are controlled for; it seems this is not a spurious association arising out of an interaction between the well-documented health inequalities between the rich and poor and a selection effect where those on higher incomes might be gravitating towards areas with plenty of greenspace. In fact, large-scale studies on English and Dutch populations have found that it is those in the lowest income groups that benefit the most from having greenspace near their home (Maas *et al.*, 2006; Mitchell and Popham, 2008).

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Kathryn Gilchrist

School of the Built Environment,
Heriot-Watt University, UK

The level of urbanity also seems to affect the relationship between greenspace and health. In urban areas more greenspace is associated with better health regardless of income levels, but in both rural and suburban areas with high income levels there is no significant association (Mitchell and Popham, 2007). It has been suggested that this pattern may be due to the fact that outside the urban area the majority of high income households have their own garden and therefore they may rely less on public greenspace. One unexpected finding in this study was that there was an inverse relationship between greenspace availability and health found in the case of low income suburban areas. It may be that deprived peripheral housing estates have a larger proportion of low quality and inaccessible greenspaces. The authors suggest that either 'the health benefits of poor quality greenspace, albeit in large quantities, are not sufficient to negate the health problems of the resident population; or poor quality greenspace is actually detrimental to health' (Mitchell and Popham, 2007:682).

Researchers have also looked at how the prevalence of different types of health complaints varies with greenspace availability. On the whole the strongest negative associations are with mental health problems like anxiety and depression, diseases where stress is a risk factor, and on respiratory complaints (Mitchell and Popham, 2008; Maas *et al.*, 2009). The link between greenspace and respiratory complaints seems natural given the positive effect of vegetation on air quality. But how do we explain the associations between greenspace and other health complaints, particularly mental health issues?

When considering the potential causal pathways that may link green environments and health, there are two prime suspects. The first is physical activity. Perhaps having more greenspace near home encourages people to be more physically active, and this has a positive influence on their physical and mental health. The evidence here appears to be mixed. One study from the Netherlands factored in physical activity levels and found that they did not explain the link between greenspace and health (Maas *et al.*, 2008). Another study from Australia using similar methods found that levels of physical activity accounted for the correlation between greenspace and physical health, but not mental health (Sugiyama *et al.*, 2008). Therefore it seems that, particularly for mental health and wellbeing, effects on physical activity levels alone do not sufficiently explain the patterns that have been found.

Green exercise

The other possibility is that there is an independent effect of the physical environment itself. Research into green exercise

has explored the synergistic effects of physical activity and the environment in which activity takes place. Green exercise refers to physical activity outdoors in a primarily green environment and includes activities like walking, hiking, running, cycling, gardening and nature conservation. Such studies on green exercise have demonstrated that the environment does affect the psychological outcomes of exercise, with views of pleasant scenes, particularly of a green environment, having the greatest positive effect (Pretty *et al.*, 2005). Attempts have been made to define dose-response curves for green exercise, and these indicate that large benefits can be gained from even brief five-minute spells of green exercise (Barton and Pretty, 2010). Those with poor mental health appear to gain more in terms of improvements in mood and self-esteem as a result of green exercise than those with good mental health (Roe and Aspinall, 2011), and green exercise projects are increasingly seen as a valuable form of treatment for mental health problems. Various evaluations of health walks programmes, green gyms, nature conservation projects, forest schools and horticultural therapy have supported the view that regular contact with nature has a measurable positive effect on participants' subjective wellbeing and coping resources over the longer term (Wilson *et al.*, 2008). However, it is important to recognise the other factors that may contribute to these benefits; the social context of organised green exercise programmes and the acquisition of new skills and knowledge are also likely to have a positive impact on self-esteem.

Restorative environments

A large body of research exists on the psychological benefits of passive interactions with natural environments, and even from viewing nature through windows and in photographs and art. This 'restorative environments' research focuses on the independent effect of the perception of the physical environment. The term restorative environment is used to describe places that promote psychological 'restoration' processes. In this context restoration is defined as 'the process of recovering physiological, psychological and social resources that have become diminished in efforts to meet the demands of everyday life' (Hartig, 2007:164). The rest of this paper examines the research on this restorative effect of nature.

A large number of studies have investigated the immediate physiological and psychological responses to different environments, and have found that exposure to natural environments has a number of benefits over built environments lacking natural features. Positive effects of nature experience on physiological indicators including

blood pressure, heart rate, brainwave patterns, muscle tension, stress hormone levels and even immune system functioning have been demonstrated (Hartig *et al.*, 2003; Park *et al.*, 2010). In terms of the immediate cognitive and affective responses, exposure to natural environments has repeatedly been shown to improve ability to direct attention and maintain concentration, and to improve mood, particularly in terms of reducing negative emotions like feelings of stress, anxiety and frustration (Hartig *et al.*, 2003; Hartig, 2007). These responses have been seen not just when people directly experience an outdoor green environment, but also when viewing them through windows and even in videos and photographs. Again, the greater an individual's need for restoration (i.e. the more stressed and/or fatigued they are) the more they benefit from exposure to a natural environment (Ottoosson and Grahn, 2008).

Much of this research has been conducted by environmental psychologists in Scandinavian countries and the USA, but restorative environments have recently been gaining interest all over the world and attracting interest from researchers in a range of academic disciplines other than psychology, including urban planning, landscape architecture and health research. Similar positive outcomes for wellbeing have emerged in populations the world over. Two theoretical frameworks arose to try to explain the mechanisms by which these benefits arise: stress recovery theory and attention restoration theory. Each emphasises a different process of psychological restoration, and the theories are for the most part considered by researchers to be complementary rather than competing.

Stress recovery

This theoretical framework promotes a functional-evolutionary perspective on restoration, referred to variously as stress recovery, psychophysiological stress reduction and psychoevolutionary theory. In this case the costs of stress responses to threats and subsequent needs for restoration are emphasised. Stress recovery theory proposes that rapid-onset emotional reactions are a critical part of the initial response to threats, mobilising the body's physiological systems and motivating 'fight or flight' behaviour. However, the costs of this stress response are high (strong negative emotions and energy-sapping physiological arousal), so there is a need for restoration to occur when the threat has passed. It is proposed that we evolved a propensity to respond both emotionally and physically in a strong positive way to unthreatening natural environments as an adaptive mechanism to allow fast and effective recovery from the stress response, and that modern humans retain this adaptation. It is thought that this 'prepared response' occurs

in natural environments and not built environments because we have spent millions of years evolving in natural environments and adapting to them, but have only lived in permanent settlements for a very short time in evolutionary terms (Ulrich, 1993).

The discussion of what makes a natural environment restorative from the perspective of stress recovery theory draws on evolutionary theories of landscape aesthetics. These suggest that features of a stress-reducing environment include those which signal a positive human habitat through 'affordances' such as safe drinking water, food and shelter and also those which allow open views of the landscape in conjunction with more enclosed, private spaces of refuge (Ulrich, 1993).

Attention restoration

This framework explains the restorative benefits of nature through cognitive rather than psychophysiological processes. In this theoretical framework, benefits to mood and reduction in feelings of stress and anxiety are linked to an overarching benefit to information processing capabilities. Attention Restoration Theory (ART) rests on the concept that we have a finite capacity for focusing our attention, which becomes depleted with mental effort, causing a state of 'attentional fatigue' and a concomitant reduction in mental performance. It is argued that maintaining directed attention requires blocking out unwanted distractions from the environment, and for this to happen an inhibitory mechanism is needed. Exercising this mechanism uses energy and depletes attentional resources. When our ability to direct attention has become depleted, restoration through rest, sleep or relaxation in a supportive environment must occur before performance can rise again (Kaplan, 1995). Natural environments are held to be most conducive to attention restoration, but effective restoration need not be confined to these. According to ART this state of mental fatigue has negative effects not just on performance in tasks requiring focus and concentration, but also on moods and behaviour – with irritability, frustration, impatience, depression, impulsivity and social irresponsibility implicated as consequences of attentional fatigue (Kaplan, 1995).

ART proposes four components that contribute towards an environment's potential to promote attention restoration – 'being away', 'fascination', 'extent' and 'compatibility' (see Box 1). ART holds that natural environments often offer high levels of each of these components for restoration, more so than most urban environments, and this is the reason for the patterns of variation in restoration between the natural

and urban. Perception of high levels of these qualities has been linked to objectively measured restoration benefits (Berto, 2005; Chang *et al.*, 2008). Other researchers have developed these components and used them as a basis for measuring the perceived restorative potential of environments (Hartig *et al.*, 1997).

Box 1. ART's four components of restorative environments

- 1) *Being away* – This relates to achieving a sense of distance (at least psychologically, if not physically too) from demands and drains on directed attention.
- 2) *Fascination* – This describes surroundings which attract interest and draw the attention without any effort on the part of the viewer. A distinction is made between 'hard' and 'soft' forms of fascination. Soft fascination, where involuntary attention is drawn in a manner that still allows room for self-reflection during the experience, is thought to be particularly important for attention restoration.
- 3) *Extent* – For effective restoration the environment must be coherent and comprehensive enough to feel like a world to itself. It must provide enough to see, experience, and think about so that it takes up a substantial portion of the available room in one's head' (Kaplan, 1995:173).
- 4) *Compatibility* – This relates to the fit between the individual's purposes and inclinations for behaviour in the environment and the behaviour that the environment permits or demands. A compatible environment is one in which it is appropriate to behave in a way that feels comfortable or natural, and which allows desired activities to be carried out with ease.

The role of forest and woodland in psychological restoration

Trees appear to play a significant part in promoting restoration processes. Woodlands and forests are commonly reported as the most desired environment for relaxing and recovering from stress and sustained mental effort (Grahn and Stigsdotter, 2003; Hansmann, *et al.*, 2007). They also feature highly in studies of favourite places, thought to allow a view into the places people choose for the purposes of regulating their emotions (Korpela *et al.*, 2008). On the other hand forests can also be perceived as a threatening environment. This connotation of forest environments is deeply embedded in our culture – the fairytales we grow up hearing are steeped in imagery of forests as foreboding places, and media reports of attacks in wooded areas are common. Many people report feeling unsafe in urban

woodlands, with women often feeling less safe than men (Ward Thompson *et al.*, 2008).

Most studies measuring restorative outcomes to investigate the psychological effects of different environments have made broad comparisons between 'natural environments' and 'built environments'. It should be noted that the term 'natural environment' is used in a broad manner in the restorative environments literature to encompass all environments where buildings and human artefacts do not dominate. Few distinctions are therefore made between green environments with a high level of human influence (e.g. parks, plantation forestry and agricultural landscapes) and those which are more natural in an ecological sense, like wilderness areas, ancient woodlands and semi-natural greenspace. Little research has been specifically focused on the restorative effect of forest and woodland environments, although these commonly feature as examples of natural environments. An exception to this is a body of research from Japan into the benefits of the activity known as *shinrin-yoku*.

Shinrin-yoku is defined as 'taking in the forest atmosphere or forest bathing' (Tsunetsugu *et al.*, 2010:27). This term was coined by the Forest Agency of Japan in the 1980s and has since become a recognised and popular activity for relaxation and stress management. The research on *shinrin-yoku* differs from that on restorative environments in the West in that it emphasises the olfactory element of the forest experience. This aspect has been neglected in other studies, which have mainly focused on the visual aspects of environmental perception, and in a few cases the auditory experience. *Shinrin-yoku* is conceived as a form of 'natural aromatherapy' where the inhalation of wood essential oils (phytoncides) is considered as the prime pathway to the relaxation effect, although beautiful scenery, tranquillity and fresh air are still recognised as important aspects of the positive forest experience (Li, 2010:9).

Field experiments across Japan have found that subjects taking part in short walks in both a forest and a city displayed different physiological responses to the different environments. The forest walk produced significantly lower concentrations of the stress hormone cortisol in participants' saliva, lower pulse rate and blood pressure, lower sympathetic nerve activity (associated with the 'fight or flight' response), and greater parasympathetic nerve activity (associated with relaxation, the 'rest and digest' response) (Park *et al.*, 2010). Large reductions in levels of adrenaline and noradrenaline (hormones associated with stress and the sympathetic nervous system), and in the blood-glucose levels of diabetes sufferers have also been found after forest bathing (Li, 2010). Other studies have demonstrated a

positive and prolonged effect of shinrin-yoku on immune system functioning. A forest bathing trip (lasting 3 days and 2 nights) resulted in significant improvements in various indicators of immune system functioning, including the number and activity of natural killer (NK) cells, and levels of anti-cancer proteins in the blood (Li, 2010). NK cell activity remained elevated well after the trip had finished, to the point where testing 30 days afterwards showed that in male subjects the difference from the baseline measurements was still significant. In female subjects the difference was still significant after 7 days but not after 30 days, although average levels were still higher than they had been before the trip. When forest bathing trips were compared with physiological measures taken on a city sightseeing trip (of the same duration and with the same amount of walking) no change in NK cell activity was found. It is known that stress can have a dampening effect on the immune system, but these studies are the first to demonstrate that reductions in stress as a result of walking in a natural environment has a measurable and long-lasting effect on immune functioning. What is not known is how shorter visits to forests affect the immune system, and whether the longer-term elevation in immune activity seen as a result of weekend forest trips can also be achieved with regular short visits.

Aside from the objective physiological effects of shinrin-yoku, similarly positive effects on mood have also been demonstrated. Significant differences have been found between the changes in mood states on short forest and city walks, with forest walks consistently producing positive effects in terms of reducing ratings of tension and anxiety, depression and dejection, anger and hostility, fatigue and confusion, and in boosting feelings of vigour. Conversely, the city walks had a negative influence on all of these mood measures (Park *et al.*, 2010). Similar positive effects on mood were previously found by Morita *et al.* (2007), who compared mood ratings made on forest visit days with control days (days off work where a forest was not visited). Participants' moods were better on the forest days, regardless of whether participants took part in exercise or their own favourite activities on the control days. Again, the higher the baseline stress level, the greater were the positive changes in mood.

Overall, the body of work on shinrin-yoku provides strong support for the positive psychological and physiological effects of the forest environment. The question is whether these findings can be generalised for populations where appreciation of trees and forests is perhaps less culturally embedded. Also, if smelling and inhaling wood essential oils does contribute towards the restorative effects of shinrin-yoku, do the essential oils from the native tree species of other regions or countries have a similar effect?

Variation in the restorative quality of forest and woodland environments

So far this paper has discussed forest and woodland environments in broad terms. The research on shinrin-yoku and studies measuring levels of actual restoration in natural environments provides evidence on the benefits of visiting forests, but it contributes little to our understanding of how restorative quality may vary in different types of woodland, at different times of the year, and with different management techniques. Studies aiming to measure 'perceived restorativeness' rather than actual outcomes of restoration offer some hope in this respect. Environmental psychologists have developed several psychometric scales to measure perceived restorative quality. Most of these scales are based on the components of restorative environments according to Attention Restoration Theory – the feelings of 'being away', opportunity for 'fascination', the 'extent' of the environment and its 'compatibility' with intended or preferred behaviour. The most commonly applied ART-based scale is the Perceived Restorativeness Scale (Hartig *et al.*, 1997), which exists in various versions. Other scales have been designed to measure restorative potential based on users' perceptions of their own restoration outcomes there, and these focus not just on attention restoration but also on stress recovery responses (Han, 2007; Korpela *et al.*, 2008). All of these psychometric scales are administered in a questionnaire format, where participants rate their agreement with various statements. Perceived restorativeness ratings on such scales have been shown to relate to measured restoration outcomes, supporting their validity for use in assessing the restorative quality of different environments (Hartig *et al.*, 1997; Chang *et al.*, 2008).

Studies employing such scales have typically found forest environments to be high in restorative quality, as judged in visual terms from photographs (Peron *et al.*, 2002; Han, 2007; Vassiljev *et al.*, 2007). The evidence regarding different types of forest is mixed. Coniferous forest was rated higher in perceived restorativeness than deciduous forest in Han's (2007) study using ratings from American students. In contrast, Vassiljev *et al.* (2007), who have conducted the only study of this kind to evaluate a comprehensive array of vegetation types, found mature (thinned) deciduous woodland highest in restorative quality of all the vegetation types studied, for both summer and winter conditions. Deciduous stands (both mature and young) were on average rated higher in restorativeness than the coniferous stands by their Estonian participants, and among the coniferous scene examples pines were rated higher than spruce stands. Apparent ease of movement and smoothness of ground cover seems to play a part here, as woodlands featuring a dense understorey (both

coniferous and deciduous) ranked much lower than those which appeared more navigable.

Many of the woodland vegetation classes studied received higher ratings in winter than summer conditions, with the opposite being found for the more open field and grassland scenes. Thus, it seems that forests may be especially valuable as a restorative environment over other types of natural landscape during winter, presumably due to the fact they offer shelter from the elements, allow greater visual access and are easier to traverse in winter when herbaceous understorey vegetation has died back. Visibility and ease of movement also influence feelings of security in urban woodlands (Ward Thompson *et al.*, 2008). Perceiving an environment as threatening negates the potential for restoration – it creates anxiety itself. Therefore any characteristics which enhance users' feelings of security should enhance the restorative potential of woodlands.

The role of trees in the built environment

This section moves the discussion on to the value of street trees and trees as part of the landscape of built environments. These have featured strongly in studies assessing the restorativeness of built environments, and the potential cumulative benefits of retaining and incorporating nature into urban landscapes. Again, however, such studies have usually focused on natural features in general, rather than trees in particular. Regarding the specific role of trees, many studies on environmental preferences show that adding a small number of mature trees to a built scene can vastly enhance viewers' perceptions. In terms of restorative potential, the proportion of a scene formed by trees has been seen to be a predictor of ratings of the perceived restorativeness of pocket parks (Nordh *et al.*, 2009).

A high profile series of studies by Frances Kuo and colleagues in the USA has investigated the cumulative effects of residents' access to green areas in a large public housing project. These studies have shown that those who lived in buildings with small greenspaces adjacent (typically a patch of grass and/or a small number of trees) are less prone to acts of intra-family aggression and violence and cope more effectively with the stress of poverty than those who live in 'barren' buildings with no adjacent greenspace or trees (Kuo, 2001; Kuo and Sullivan, 2001). The tenants in greener buildings also displayed lower levels of mental fatigue. This enhanced attentional capacity was shown to have mediated the negative relationship between nearby nature and aggression and the positive relationship with coping ability, indicating that these are not spurious associations.

Another line of enquiry has focused on the cumulative benefits of nature in window views from inside buildings. It is thought that natural features in window views allow people opportunities for 'micro-restorative' experiences in their everyday indoor environments, which, though brief, can mount up to result in a measurable cumulative benefit (Kaplan, 1993). There are now quite a number of studies that have looked at how nature in window views affects wellbeing in a variety of built environment contexts (see Table 1).

Overall, the evidence presented in this section points to the wide-ranging potential benefits of trees in the built environment on wellbeing. The fact that causal links cannot be proved from correlations in the data is a limitation of these studies. However, when taken together we see there is a considerable amount of research supporting claims that having access to nature and views of nature in everyday urban settings has a beneficial psychological effect on city-dwellers.

Conclusions and recommendations for future research

The evidence from the research presented in this paper suggests that urban woodlands and trees in the built environment (and nature in general in the urban context) can have a measurable effect on people's wellbeing and mental health. Having access to local greenspace has a positive effect on health and particularly on mental health and diseases related to stress. Spending time in green environments, whether combined with physical activity in green exercise or simply for passive relaxation, has positive effects on a range of physiological and psychological indicators, including blood pressure, levels of stress hormones, immune system functioning, cognitive functioning, mood and self-esteem. Even having the opportunity to view trees and nature through windows appears to carry psychological benefits. The evidence supports a view of trees and woodlands as 'nature's health service', offering a supportive environment for psychological restoration from stress and mental fatigue and in the longer term buffering the negative effects of daily stresses, boosting coping capacity, and influencing positive behaviour changes and self-confidence. A consistent theme which emerges from the research is that the people that benefit the most from access to high quality greenspace are the most vulnerable – those with poor mental health status, and those living in the most deprived neighbourhoods. Public greenspaces including urban woodlands are free to all and

Table 1 Effects of nature in window views on psychological resources.

| Study | Findings | Sample |
|--------------------------------|--|--|
| Healthcare context | | |
| Ulrich (1984) | Hospital records of patients recovering from surgery whose window view contained either trees or a brick wall were compared. Those with a view of trees required fewer doses of strong pain relief medication, were discharged earlier, and received fewer negative comments from nurses. | n=46 patients, Pennsylvania, USA |
| Residential context | | |
| Kaplan (2001) | Nature in window views from home was associated with higher satisfaction with the neighbourhood as a whole, and with higher self-reported ratings of wellbeing. Trees in window views predicted feelings of being at peace and a lack of trees was associated with feelings of being distracted and unable to concentrate. | n=188 residents of apartment blocks, Michigan, USA |
| Wells (2000) | Children who relocated from a home with little nature in window views to a home with more nature in view improved in their ability to concentrate. Changes in housing quality did not explain the improvements. | n=17 children, USA |
| Taylor, <i>et al.</i> , (2002) | Girls who had more nature in the window views from home displayed greater evidence of self-discipline. The same relationship was not found for boys. | n=169 children/parent pairs, Chicago, USA |
| Tennessen and Cimprich (1995) | Students with more nature in their window view performed better on attention tests. No difference was found for mood states. | n=72 undergraduate students, USA |
| School context | | |
| Matsuoka (2010) | Greater quantities of trees and shrubs in window views from school buildings were associated with higher test scores, graduation rates, and students' intentions to progress to higher education, and with lower levels of criminal behaviour. Large featureless expanses (e.g. lawns, sports pitches, car parking) had a negative effect. Socioeconomic and ethnic makeup of the student body, number of students and age of buildings were controlled for. | n=101 public schools, Michigan USA |
| Workplace context | | |
| Kaplan (1993) Study 1 | Desk workers with nature in their view reported fewer ailments in the past 6 months, and also higher job satisfaction than those without nature in view. | n=120 office workers, USA |
| Kaplan (1993) Study 2 | Desk workers' satisfaction with their window view increased with the number of natural features in view. In turn satisfaction with the view predicted perceptions of job satisfaction, task enthusiasm, patience, frustration, life satisfaction and general health. | n=615 office workers, USA |
| Leather <i>et al.</i> (1998) | A view of natural elements in window views from the workplace was found to buffer the negative effect of work stress on intention to quit, was associated with higher job satisfaction and had a marginal positive effect on general wellbeing. | n=100 wine production workers, southern Europe |

constitute an important community resource. However, the benefits of this resource for the urban population depend not just on quantity and accessibility of greenspace but also the quality of the environment.

There is still much work to be done in furthering our understanding of the value of forest, woodlands and trees in general in creating restorative environments, and of the extent of benefits of their presence on the wellbeing of the urban population. Most of the research into restorative environments has not differentiated between the effects of trees and woodland and of urban nature in general. Further focus on the specific benefits of spending time in woodland environments and of the benefits of trees in the built environment is warranted. There is also little evidence on what types of woodland and forms of management are most supportive of restoration processes, and how seasonal changes in the environment may affect these processes. Further studies assessing the perceived restorativeness of different types of urban greenspace using psychometric scales may provide a valuable line of inquiry in this respect, moving the discourse on to how we can plan, design and manage greenspace and the built environment to maximise opportunities for psychological restoration.

Another issue which deserves greater focus is individual differences in the restorative effects of nature. For the most part the literature treats restorative responses to natural environments as being innate, evolved responses which are therefore universal, although modified by cultural beliefs, life history and individual tastes. However, the focus on reporting mean values of effects on physiology, cognitive functioning, moods and behaviour may mask important patterns. The important question – ‘does everyone have the potential to benefit from contact with nature?’ – has received little attention. It may benefit future research on this subject to bear in mind the words of William Blake: ‘The tree which moves some to tears of joy is in the Eyes of others only a Green thing that stands in the way’ (Blake, 1799). It may be that there are important things to be learned not just from those who seem to benefit the most from nature experiences, but also from those who are the least affected. This may in the future help us to understand how much of the restorative effect of nature is down to evolved responses and how much is influenced by culture and social-constructions of nature (and therefore subject to change). From a pragmatic perspective, however, this could be argued to be of limited practical relevance. What we do know is that overall urban woodlands and trees provide a valuable resource for the health and wellbeing of urban residents, and they have been demonstrated to have a significant influence on population health as a whole, with particularly beneficial

effects for the growing number of people experiencing high levels of stress and poor mental health.

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