PERCEPTION OF NATURAL ECOSYSTEMS AND URBAN GREENERY: ARE WE AFRAID OF NATURE?

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ABSTRACT

A set of pictures of natural vegetation in protected areas and urbanized ecosystems were shown to respondents. Protected areas were ranked as natural. Perceived naturalness of ecosystems was positively correlated with the sense of beauty and preference for recreational use, but negatively with the feeling of security. When the respondents rated ecosystems as natural, they also regarded them as more dangerous. A cumulative link mixed model supported the statement that perceived ecosystem naturalness decreased the feeling of safety; this relationship was comparatively weaker among people living in small villages and gardeners.

Keywords: natural ecosystems; protected areas; safety; urbanization; wilderness

Introduction

Today, mankind is experiencing a dramatic shift towards urban life. Whereas in 1900 a mere 10 per cent of the global population were urban dwellers, that percentage now exceeds 50 per cent and will rise even more in the future (Grim et al. 2008). Vegetation may help to mitigate many aspects of urban development by moderating the climate, improving air and water quality, and by regulating run-off (Grim et al. 2008). Vegetation has also been shown to improve emotional states and relieve stress (Ulrich 1979; Kaplan 1995), enhance subjective well-being (Ulrich et al. 1991) and cognitive functions (Hartig et al. 2003), reduce pain in patients (Lechtzin et al. 2010) and bring other health- and wellness-related benefits (Velarde et al. 2007). Many studies focus on the role of city vegetation in comparison with non-vegetated urban areas, but less attention has been paid to comparing urban green spaces and natural vegetation. Urban greenery differs substantially from natural ecosystems in that it harbours larger proportions of non-native species and is usually artificially maintained (Grim et al. 2008), leading to landscape homogenization and reduction in biodiversity (McKinney 2002; Grim et al. 2008). In addition, urban vegetation usually requires more water and nutrients than local natural vegetation (McKinney 2002), which may affect ecosystem services provided by this type of landscape. In this study, we focus on differences in human perception of beauty and safety in natural ecosystems and urban green areas.

Material and Methods

Prior to collecting data, we downloaded two hundred colour photographs of central-European landscapes from the internet. One hundred of these photographs depicted urban green spaces, parks and gardens, and the remaining hundred were pictures of protected areas. All photographs were landscape-oriented and taken in sunny weather during summer months. We then randomly selected eight pictures of urban green spaces and eight of protected areas, which were regarded as natural landscapes. The selected pictures reflected the heterogeneity of urban greenery and natural landscapes. The photographs of urban greenery included ornamental gardens, romantic gardens, aristocratic parks and city parks. Photographs of natural landscapes were classified as either forests, steppes or forest steppes, meadows or water ecosystems.

The group of respondents that participated in our study comprised 40 women and 27 men aged between 21 and 74, with an average age of 28.8 years, of whom 27 were from a large city (Prague), 35 from a medium-sized city (Pardubice) and 5 from villages with less than 200 inhabitants. They were asked to fill in questionnaires, which were used to collect the data.

The respondents were first asked to provide their socio-demographic information (age, gender, highest level of education, place of residence) and then indicate all their outdoor activities (sports, camping, gardening or other). In the next step, each respondent evaluated whether each of the photographs in the set of 16 photographs were of natural ecosystems or urban greenery. Finally, the respondents were asked to rate the beauty, naturalness and safety of each landscape depicted in the photographs using the four-point Likert scale.

The agreement between the researchers' and respondents' categorization of the photographs as natural landscapes or urban greenery was determined using a chi-square goodness of fit test. Correlations among the respondents' ratings of beauty, naturalness and safety and type of landscape were measured using Spearman's rank correlation coefficients. The perceived level of safety across the landscape categories was compared using one-way ANOVA. A cumulative link mixed model

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was used to evaluate the effects of the respondents' perception of landscape naturalness (independent variable) on their perception of safety (dependent variable), while controlling for the respondents' characteristics (covariates).

Results

The match between the respondents' rating of landscape naturalness matched that of the researchers almost perfectly. Among the total of 1072 ratings (16 photographs per set, each rated by 67 respondents) there were only four mismatches. Consequently, we found no statistically significant difference between our classification of landscape naturalness and that of the respondents (χ^2(DF) = 1071, p = 0.902).

The perceptions of beauty, security and naturalness were all positively and statistically significantly correlated with only one exception. The correlation between the perception of naturalness and security was statistically significant but negative (Table 1). Plotting the perception of safety against the perception of naturalness clearly showed that landscapes that were evaluated as natural were perceived also as less safe than those evaluated as urbanized (Fig. 1).

Table 1 Spearman rank correlation coefficients (df = 1071) of the opinions of respondents to features of pictures of landscapes. All the correlations are significant at p < 0.01.

	Beauty	Security	Naturalness
Security	0.22		
Naturalness	0.13	–0.43	
Recreation	0.57	0.28	0.18

This simplified picture may have been affected by the fact that most of the evaluations were correlated, possibly due to autocorrelations introduced by the dependence of evaluations made by each respondent (note that each respondent rated all 16 photographs). To cope with the fact that evaluations made by the same respondents may be auto-correlated, we ran a cumulative link mixed model with the respondents' evaluations of landscape safety as the dependent variable and their evaluations of landscape naturalness and the respondents' characteristics as independent variables. This model also controlled for the dependence of evaluations made by the same respondents. Prior to fitting the data to the model, we converted the ratings of naturalness into binary format by collapsing the first and second, and third and fourth category of naturalness (cf. Fig. 1).

Results provided by the cumulative link mixed model are consistent with our previous result showing a significant negative effect of the perception of naturalness on the perception of safety (Table 2). This effectively means that landscapes which are perceived as natural are also perceived as dangerous. Other than that, the tendency to rate natural landscapes as dangerous was weaker among people who live in the country and among people who practise gardening as a hobby.

Table 2 Results of a cumulative link mixed model in which respondents' evaluation of the dangerousness of different landscapes is the dependent variable, and their evaluation of naturalness of the same landscapes and the respondents' characteristics are independent variables. Ratings of naturalness were collapsed into two categories (natural vs. urban by pooling ratings 1 and 2 from Fig. 1 as natural, and 3 and 4 as urban). Gender, size of the home municipality and the preferred type of recreation were used as explanatory variables. Only significant variables and significant interactions are shown. *** Significant at p < 0.001, * significant at p < 0.05.

Model parameters	Estimate	Significance
Naturalness (binary)	1.9114	***
Interactions		
Naturalness *villagers	–2.842	***
Naturalness *gardeners	–0.5818	*
Variance of random effects (respondent)	0.37	
AIC	2278	

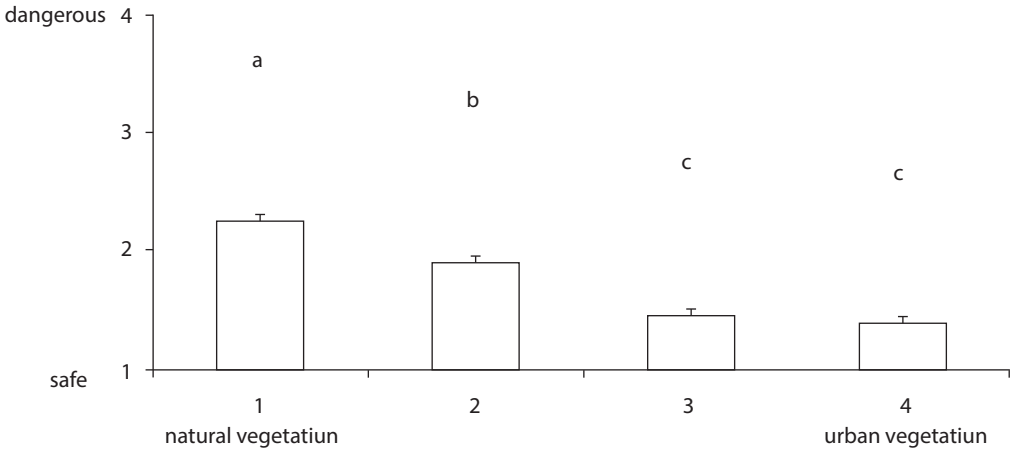

Fig. 1 Respondents' perception of safety on a scale of from 1 (safe) to 4 (dangerous) in relation to the perception of naturalness of vegetation rated from completely natural (1) to strongly urban (4). Bars represent SD; statistically similar columns are indicated by the same letter (LSD post hoc test, p < 0.05).

Discussion

Our results indicate that people perceive natural landscapes as dangerous. This finding may seem to contrast with observations made by others (Ulrich 1979; Parson 1991; Kaplan 1995; Van den Berg et al. 2003), who report an increase in positive emotions and a healthy, restorative effect of vegetation and natural habitats in comparison with urban man-made environments dominated by buildings. Lee et al. (2008), for instance, show that neighbourhood satisfaction increases with the amount of vegetation surrounding houses. However, contrary to previous studies, we did not compare vegetated vs. non-vegetated urban areas. Instead, our study focused on vegetated landscapes that differ only in whether they are natural or man-made. We revealed that the way vegetation is organized in the landscape (natural vs. urban) can affect the perception of the safety it provides. Interestingly, Jorgensen et al. (2002) also conclude that it is the spatial arrangement rather than the amount of vegetation that affects people perception of safety.

Our questionnaire did not enquire about the characteristics of the risks perceived by respondents in relation to natural landscapes. Note, however, that the average level of perceived risk recorded in our study was rather low even in natural landscapes (being roughly equal to the bottom third of the risk perception scale). This means that the level of risk perceived is probably not related to any life-threatening danger. Rather, we may think of it as perhaps caused by fear of minor injury from a wrong step on an *uneven surface, getting stung by* stinging nettles, being bitten by an insect or a tick. Fear of animals that are actually harmless, such as various spiders or frogs, may also be responsible for this increased perception of risk. Other possible components of perceived risk are virtual, evolutionary or atavistic fears related to threats such as dangerous wild animals, once posed to humans. Interestingly, the evolutionary fear of "wild beasts" is strongly persistent in human culture, as evidenced by traditional stories, fairy tales and religious texts (Cronon 1996).

Kaplan (1987) points out that humans prefer habitats offering some aspect of safety, namely refuge from an approaching enemy. This is also the explanation offered for the fact that people prefer savanna-like landscapes (Balling and Falk 1982). Indeed, the perceived dangerousness of natural landscapes may also be related to higher vegetation density and fear of criminals lurking in thick vegetation, in spite of the fact that in reality crime rates are lower in more vegetated environments (Kuo and Sullivan 2001).

More generally, the lack of safety associated with natural landscapes might be related to how unpredictable some natural landscapes are. By contrast, man-made environments are created for a purpose, so they must be more predictable by definition.

Our results indicate that natural habitats are perceived as less dangerous by people who live in villages or are gardeners. This observation is, in fact, consistent with fears of relatively benign dangers such as ticks, nettles or ankle-spraining holes. After all, one is unlikely to live close to natural habitats or look after a garden if he or she is afraid of natural habitats.

Evaluation of natural and urbanized landscapes in the sense of habitats affected either by natural forces or by human activity may seem a bit fuzzy in the context of European landscapes because most of them are affected by humans to some extent. The distinctiveness of protected areas is apparent also in our study, which found a surprisingly high ability of laypersons to differentiate between urban and natural landscapes (i.e. driven mainly by natural processes). This fact implies that a set marker must exist that allows even lay people to distinguish between natural landscapes formed to a large degree by natural processes and man-made urban greenery where natural forces play a lesser role.

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