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University of Applied Sciences Rapperswil, Switzerland, 13-17 September 2006. Rapperswil.

The Ecological and Human Benefits of the Nature-Based Recreational Area

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Keywords: Attention restorative effect, perceived restorative scale, landscape ecology, benefit.

Introduction

Psychophysiological researches have emphasized the influences of environment on individuals' stress (Ulrich 1981, Parson et al. 1998; Honeyman 1992) and the influences of landscapes on restorative attention (Kaplan & Kaplan 1989). Parsons (1998) indicated that, compared to cities, Nature is able to relieve one's tension and anxiety effectively. Keeping the benefits of landscape ecology structure in mind, the present research pursues the influences of landscape structures on one's psychological as well as physiological responses.

The research purposes of this study are to realize the effect of landscape structures on participants' physiological reactions (Electroencephalography, EEG; Electromyography, EMG; and Heart Rate, HR) and to realize the effect of landscape structures on participants' psychological reactions (Perceived Restoration Scale, PRS) in a natural based recreational area.

Methods

In order to measure visitors' benefits in the nature-based recreational areas, this study adopted the items of the Perceived Restoration Scales (PRS) as the index of respondents' psychological responses. Furthermore, the physical responses of the right and left hemisphere brain wave (EEG), the Electromyography (EMG) value of respondents' forehead muscle were also included as indicators.

From a conceptual perspective of psychophysiological benefits resulting from landscapes, it is found that both Kaplan and Ulrich proposed the aesthetic theory of environmental evolution. While Kaplan highlighted the cognitive process, Ulrich proposed a combined analysis of emotional, physical, and cognitive reactions. The present study examines the influence of landscapes on both the physiological reactions and the psychological reactions.

The relationship between landscape and species are emerging issues that have been depicted in many articles. Landscape structures are helpful to model the distribution of birds and also useful on the land policy. Studies assert birds are particularly sensitive to the landscape patch size. Birds are good subjects to test the relationship between species and landscape elements, while landscape scale is a suitable scale to test the relationship between species and land use. Different studies have categorized land uses into different types. The main categories include constructed areas, farms, man-made grassland, man-made woods, un-worked areas, grassland, natural woods, water bodies, and waterside areas.

Categories in this study were learnt from previous studies and interviews with experts of related fields to select the most representative landscape structure indices of the testing sites. The landscape structures selected in this study include vegetated lands, un-worked areas, woods, grasslands, and farms.

The eCognition ver. 4.0 was used to digitize the aerial photographic maps with the scale of 1/5000, followed by the calculation of indices of the landscape's ecological structures with FragStats for Arc View. The relationships among the landscape ecological structure indices, bird di-

versity, and the respondents' responses indices were tested. Respondents' perceptions of each recreational area were recorded with their oral statement for a further qualitative analysis.

Results

The result is consistent with previous studies on the relationship between bird capita and fragmented built areas, since the fragmented, high density and high built areas represented a space with many grain sites, which allow birds to find food and shelter. The water body shows a similar effect on the relationship between the landscape's ecological structures and bird capita especially on the 250 meters radius level of the landscape ecological map. While most of the grass and woods show an opposite effect, the higher the fragmentation of the grass and woods, the more negative the effect on the bird species and capita. The analysis results show the effect of the landscape's ecological pattern on the wildlife species.

Most of the landscape's ecological structure indices have a positive effect on the respondents' rEEG, lEEG, and PRS responses. All of the built land indicators have a positive effect on the EMG and HR responses, while all the indicators of the built landscape have a negative effect on the lEEG, EMG and a very (all of them) negative effect on the psychological PRS responses.

The woods show a positive effect on respondents' lEEG and PRS responses, the water body has a positive effect on the rEEG and HR only on the 250 meters radius landscape map. All the landscape's ecological indicators have a negative effect on the PRS responses on the 250 and 500 meters radius map.

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