



The relationship between self-rated naturalness of university green space and students' restoration and health



Qunyue Liu^{a,b,c}, Yijun Zhang^a, Yiwei Lin^d, Da You^a, Wei Zhang^a, Qitang Huang^a, Cecil C. Konijnendijk van den Bosch^b, Siren Lan^{a,*}

^a College of Landscape Architecture, Fujian Agriculture and Forestry University, Fuzhou 350002, China

^b The Lab of Urban Forestry Research in Action, Department of Forest Resources Management, the University of British Columbia, 2329 West Mall, V6T 1Z4, Vancouver, Canada

^c The Lab of Collaborative for Advanced Landscape Planning, Forest Science Centre, the University of British Columbia, 2329 West Mall, V6T 1Z4, Vancouver, Canada

^d Xiamen Haicang Urban Construction Group, Xiamen 361000, China

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ABSTRACT

A growing body of evidence indicates that university green space can promote students' restoration and health. Nonetheless, only a few studies have focused on the relationship that exists among perceived naturalness, restoration and health. This study developed a self-rated naturalness scale (SRNS) to measure perceived naturalness, and examined the association between self-rated naturalness and students' restoration and health in several university campus settings. Explanatory and confirmatory factors analysis were used for the development of the SRNS. The participants in the initial part aimed at SRNS development were 422 university students from Fujian Agriculture and Forestry University in Fuzhou, China. Finally, the SRNS included three dimensions (perception of natural attributes, perception of natural feeling and perception of natural form) and eleven related indicators. Next, the SRNS was used in a second part designed to examine the relationship between self-rated naturalness and restoration and health. Eight universities in Fuzhou, China were selected as study area, and a total of 2550 students participated in the survey. Analysis of variance showed a positive correlation between self-rated naturalness and restoration. Furthermore, a significant correlation between perceived naturalness and self-rated restoration (emotional response, physiological response, cognitive response and behavioral response) was found. The strategic relapse of health uncovered a positive relationship between self-reported health, and perception of natural attributes and perception of natural form, for both males and females. Nonetheless, only among males a cognitive response was found for perceived restoration and health. The results suggest that universities' perceived naturalness contributed positively to students' self-rated restoration and health. As a result, university managers and those involved in the design of campus landscapes ought to give careful consideration to the role of campus green spaces in meeting students' restoration and health needs.

1. Introduction

In today's society, many university students are facing a series of academic, interpersonal, financial and cultural challenges (Beiter et al., 2015) which may cause psychological and other health problems. Student stress can be as a result of many factors, such as unreasonably difficult daily targets, long study hours, bad relationships with classmates, emotional distress, loss of self-identity and a low self-esteem (Kim et al., 1997; Li and Mei, 2002). Higher stress often causes increased depression (Dyson and Renk, 2006). China hosts 2852 universities, with 37 million students in 2015 (Ministry of Education of the People's Republic of China, 2016), making the concern for student

health and wellbeing eminent. Mental fatigue and mental ailments which are caused by various triggers have become a widespread problem among Chinese university students, not in the least because of the competitiveness in Chinese academic environments. Since student success is highly depended on academic achievement, students are particularly vulnerable to stress (Hipp et al., 2016; Sohail, 2013). Reports have shown that by the early 2000s, prevalence of psychological disorders among university students in China stood at 18.58%, i.e. distinctly above the state's average psycho-disorder level (Kou et al., 2001). In addition, Chinese university students showed higher level of stress than their counterparts in Japan and Korea (Kim et al., 1997).

Numerous studies have shown that human-made restorative

* Corresponding author at: College of Landscape Architecture, Fujian Agriculture and Forestry University, Fuzhou 350002, China.

E-mail address: lkzx@fafu.edu.cn (S. Lan).

environments, such as urban parks, have a significant positive effect on human health, for example by relaxing one's mind and preventing mental fatigue (Kaplan, 1995), reducing an individual's stress and anxiety (Adevi and Mårtensson, 2013; Tyrväinen et al., 2014), improving mood and self-esteem (Jo et al., 2013; Pretty et al., 2005), reducing blood pressure, and boosting one's creativity (Fjørtoft and Sageie, 2000). There are two main theoretical perspectives related to the restorative effects of restorative environments. The Psycho-evolutionary Theory holds that viewing natural environments can improve the mood of people and mitigate stress (Ulrich, 1993). Stress is usually the result of encountering situations that demand more from you in terms of capacity and an ability well above what you are capable of delivering (Evans and Cohen, 1987). However, when people are exposed to restorative environments they become positively influenced in a way that blocks out pessimistic thoughts and ruminations, turns bad mood into a better one, and reduces stress (Hartig et al., 1996; Parsons, 1991). From a different perspective, the Attention Restoration Theory (ART) emphasizes that intensive or prolonged focus leads to the exhaustion of mental capacity. However, directed attention capabilities can be restored by contact with nature, mainly because of people's perception and response to nature (Kaplan and Kaplan, 1989; Kaplan, 1995).

A substantial body of research has addressed the restorativeness of campus green space and its importance to students' health (e.g. Akpinar, 2016a; Marin and Brown, 2008; Yuan et al., 2013). Studies have demonstrated that university greenness provides an avenue for students to release their frustrations, reduce stress levels (Lau and Yang, 2009), and improve mental restoration (Felsten, 2009), mental and physiological health, and quality of life and well-being (Hipp et al., 2016; McFarland et al., 2008). Research reports reveal that students who spend time in green space are more prone to academic excellence. Students who have window view of nature reported to be more restorative than those students had no view of nature (Felsten, 2009) and students who can view lush green trees and shrubs from their windows tend to perform better than other students who had views that were partly natural or entirely built (Felsten, 2009; Matsuoka, 2010). The result is similar to those studies about student performance and campus green space (Kweon et al., 2017; Matsuoka, 2010), though the participants were adolescent students.

Although many studies have addressed the benefits of university greenness to students' restoration and health, few to date have considered the effect of the perception of campus greenness, and more specifically perceived naturalness of university greenness on student health. The perception of greenness has been shown to have a strong relationship with perceived physiological and mental health (Hipp et al., 2016; Sugiyama et al., 2008). However, we still know little about perceived naturalness and its relationship with perceived restorativeness and health. Perceived naturalness, for the most part, is used to portray the relation between landscape and its perceived natural state (Ode et al., 2009; Tveit et al., 2006). From the perspective of environmental psychology, the concept of naturalness is linked to evolutionary theories that explain our preferences for certain settings (Ode et al., 2009; Purcell and Lamb, 1998; Tveit et al., 2006), which is quite different from ecological naturalness and has theoretical support in the Biophilia hypothesis (e.g. Kellert, 1999; Kellert and Wilson, 1995). Studies have concluded that perceived naturalness is one of the reasons behind the preference for certain landscapes (Liao et al., 2013; Tveit et al., 2006). Other work has ascertained the strong relationship between landscape preference and restoration (Wilkie and Clouston, 2015; Wilkie and Stavridou, 2013). Consequently, it is highly likely that perceived naturalness of university greenness will have a major impact on student restoration. However, studies often fail to present clear and quantifiable definitions and indicators of perceived naturalness (Tveit et al., 2006). Weng et al. (2011) developed a perceived naturalness scale which contains the three dimensions of plants, animals and environment, but the scale did not consider the role of water in perception of naturalness, something which has been strongly suggested by Tveit

et al. (2006). In addition, the contribution of natural sounds to perceived naturalness was neither taken into account. Liao et al. (2013) defined naturalness in terms of the four dimensions of 'Abundance of Vegetation', 'Man-made Elements', 'Spontaneous Nature' and 'Landscape Health', but the authors still did not provide a clear scale to measure perceived naturalness. Since perceived naturalness may play an important role in restoration and stress recovery (Hartig et al., 2003; Herzog et al., 2003), a more complete scale to help evaluate perceived naturalness of a designed landscape is needed for further study.

In China, many university students spend the major part of their day on campus either studying, relaxing, eating or sleeping, as most universities require students to live in campus during term time. Since stress has been proven to be higher among university students than other members of the society (Bayram and Bilgel, 2008; Stallman, 2010), it's important for the students to frequently experience this restoration in places close to where they spend a lot of their time (Lindal and Hartig, 2013). However, the truth is that we know very little about perceived naturalness of university's greenness and the relationship between naturalness and students' restoration and health, and especially about the role of perceived naturalness. In this respect, the first goal of the present study was to develop a self-rated naturalness scale (SRNS) that can be used for measuring the level of naturalness of green space as a means through which an individual can determine their own extent of exposure to green areas. The second aim of this study was to determine the association between perceived naturalness of university greenness on the one hand, and students' self-rated restoration. The third study aim was to explore the relationship between students' perceived naturalness and their self-rated restoration and health in a Chinese context.

2. Methods

2.1. Research design

This study included two parts. The first of these was the study focused on the development and test of the SRNS. This has been done by processing exploratory and confirmatory data analysis. The study was conducted at the Fujian Agriculture and Forestry University, Fuzhou, China. Based on the first study and the test of the SRNS, the subsequent part was designed to explore the relationships among perceived naturalness of greenness, self-rated restoration and health. The second survey was carried out at 8 universities in Fuzhou city, namely Fuzhou Universities, Fujian Normal University, Fujian Agriculture and Forestry University, Fujian Medical University, Fujian University of Traditional Chinese Medicine, Fujian University of Technology, Minjiang University and Fujian Jiangxia University. These campuses were selected as they were built during different times and include varying naturalness, as will be explained later.

2.2. Part 1 of the study

2.2.1. Questionnaire design and data collection

The evaluation item of perceived naturalness was selected not only based on previous studies (Liao et al., 2013; Tveit et al., 2006; Weng et al., 2011), but also on the views of professionals in landscape architecture. Firstly, natural elements, lines, patterns, such as plants, animals, winding road and undulating terrain were considered. As it was considered highly likely that water is positively contributed to perceived naturalness (Real et al., 2000), this was also used to evaluate naturalness. Since soundscape plays an important role in landscape experience, we assumed that it may also contribute to perceived naturalness of the green environment. Thus the presence of natural sounds like bird sounds and frog sounds were also considered in the assessment scale. In order to develop a more comprehensive scale, we also invited five professional landscape architects and ten landscape architecture students to propose indicators for assessing perceived naturalness based

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