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Demographic groups' differences in visual preference for vegetated landscapes in urban green space

Ronghua Wang [a], Jingwei Zhao [b,*]

[a] School of Urban and Environmental Science, Jiangsu Normal University, Xuzhou, China
[b] School of Arts and Design, China University of Mining and Technology, Xuzhou, China

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ABSTRACT

Although previous works concluded that demographic variables of observers have strong influence on landscape preference, the questions of "which demographic characteristic(s) has(have) greater effects on preference than others" and "what are the features of a landscape preferred by each of the demographic groups" are not answered clearly up to now. This study aims at answering the two questions through a visual preference assessment with 482 laypersons as respondents. The main results include: (a) education level and gender of respondents have a significantly influence on preference assessment; (b) "naturalness", "growth status of plant" and "elements except plant" are the reliable predictors for the landscape preference of male; for female, the significant predictors are "degree of plant maturation" and "number of colors", and (c) for the landscape preference of observers with elementary education, the significant predictors are "growth status of plant", "safety" and "degree of plant maturation"; the observers with middle education and college education have the same predictors: "growth status of plant" and "number of colors"; and "naturalness" and "degree of plant maturation" are the predictors of participants with post graduate education. At last the practical implications of the results are discussed.

1. Introduction

Worldwide, landscape architects and planners have conducted landscape evaluation to explore the essence of scenic beauty, and tried to find a valid way to improve aesthetic value of a landscape. Landscape evaluation is mainly divided into two approaches: the objective, based on a physical paradigm, and the subjective, based on a psychological paradigm (Daniel, 2001; Lothian, 1999). The objective approach regards aesthetic quality as an intrinsic attribute of the object viewed and evaluating the landscape through abstract design parameters. The subjective approach assumes that the aesthetic quality is a subjective value derived by the eyes of the beholder (Lothian, 1999). However, many who conduct research on aesthetic preference assessment believe that it is a process of interactions between the physical characteristics of a landscape and the psychological responses of those who view the landscape (e.g. Strumse, 1996; Tveit, 2009; Vouligny, Domon, & Ruiz, 2009; Molnarova et al., 2012), which means that landscape preference varies not only depending on the physical landscape, but also on the demographic characteristics of observers such as cultural background (Yu, 1995), education level (Molnarova et al., 2012; Svobodova, Sklenicka, Molnarova, & Salek, 2012), gender (Strumse, 1996; Lindemann-Matthies, Briegel, Schüpbach, & Junge, 2010), age (Yamashita 2002; van den Berg & Koole, 2006), expertise (Strumse 1996; Vouligny et al., 2009), familiarity of environment (Howley, Donoghue, & Hynes, 2012), people's environmental value orientation (Howley et al., 2012; Kaltenborn & Bjerke 2002; Soliva & Hunziker, 2009) and living environment (Van den Berg & Velk, 1998; Yu, 1995). Therefore, Strumse (1996) emphasized that demographic group differences in landscape evaluation should not be neglected by planners, managers and other landscape experts.

Exploring the relationships between demographic variables and visual landscape preference provide valuable information for decision-makers. For example, the identification of similarities in landscape preference across groups would assist the development of general guidelines for the planning and design of outdoor and recreational areas, whereas the demonstration of group differences would help to sort out the cases or conditions of specific group's preference. However, previous studies primarily focus on natural scenery, cultivated vegetation such as urban parks seldom being involved, and the vegetation in urban park is often judged in a high level of beauty because it contains cues to care (Nassauer, 1988, 2011; Nassauer, Wang, & Dayrell, 2009; Tveit et al., 2006). Furthermore, the previous works often ignore the interactions among

* Corresponding author.
E-mail address: 852683076@qq.com (J. Zhao).

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Table 1
Measurement scale of vegetated landscape characteristics.

Landscape characteristic	Scoring
Vertical structure of vegetation	One layer = 1; two layers = 2; three or more layers = 3
Number of colors	One or two = 1; Three or four = 2; Five or more = 3
Color contrast	Weakly = 1; clearly = 2; strongly = 3
Naturalness	Artificial environment is dominant = 1; artificial and natural environment are joint = 2; natural environment is dominant = 3
Accessibility	Difficult to access = 1; neutral to access = 2; easy to access = 3
Visual scale	No open space = 1; semi-open space = 2; open space = 3
Degree of plant maturation	Young plants are dominant = 1; young and mature plants are joint = 2; mature plants are dominant = 3
Safety	Dangerous = 1; medium = 2, safe = 3
Growth status of plant	Bad = 1; medium = 2; good = 3
Elements except plant (water, topographic variation)	None = 1; a few = 2; more = 3

demographic variables when they check the relationships between landscape preference and demographic characteristics of respondents.

This paper aims at studying the effects of four demographic variables (gender, age, living environment during childhood and education level) on the landscape preference. The four variables are used frequently in previous works, in which the former two are innate variables and the latter two are social variables. In addition, this paper explores the relationships between 10 landscape characteristics (Table 1) and landscape preference of different demographic groups, which might guide vegetated landscape design and management of urban green space. The 10 landscape characteristics are abstracted by analyzing the landscape characteristics identified by others (Bulut & Yilmaz, 2008; Clay & Smidt, 2004; Polat & Akay, 2015; Svobodova, Sklenicka, & Vojar, 2015; Zhao, Wang, Cai, & Luo, 2013) and the features of the landscapes studied.

2. Materials and methods

2.1. Study area

Xuzhou is located in the northwest of Jiangsu province, eastern China (Fig. 1). Its climate is a typical warm humid monsoon with an average annual temperature of 14 °C and rainfall of 880 mm, and its zonal vegetation is the deciduous broad-leaved forest. Like the majority of cities in China, the green space in Xuzhou has made a great progress in the last three decades. By 2014, 70 urban parks have been built, the coverage of urban green space was 43.3% and green land area per capita was 16.2 m^2 (Xuzhou Statistics Bureau and Xuzhou Statistics Team of the National Statistics Bureau of China, 2015).

2.2. Stimuli

Huaihai Campaign Monument Park, Quan Mountain Forest Park, Pengzu Park, Yunlong Park and Happy Pavilion Park (Fig. 1) were selected for photographing by consulting five landscape architects who worked over 10 years in Xuzhou. The five parks are the most popular destinations of people's recreation locally, in which the vegetated scenes are representatives in Xuzhou. Photographs were taken by the second author of this paper at his eye level (about 162 cm above the ground) in July 2011, on clear or less cloudy days, from 10 a.m. to 4 p.m. to control for lighting conditions. And the photographer was asked to ensure the photographs to represent for a wide variety of vegetated landscapes. The equipment used was an Olympus digital camera with a focal length of 35 mm and an aspect ratio of 4:3. Although a total of 300 photographs were gathered, 30 photographs were selected using the method of stratified random sampling by a panel of qualified landscape architects. Their criteria were good photographic quality and wide variation of vegetated landscapes. These photographs included seven photographs from Huaihai Campaign Monument Park, Quan Mountain Forest Park and Pengzu Park, respectively, six photographs from Yunlong Park, and three photographs from Happy Pavilion Park because of its small area and homogeneous pattern of vegetation, which were the stimuli for landscape assessment and landscape characteristics judgment. Photographs were used in place of actual landscapes in a manner that has been widely used in previous studies (e.g. Arriaza, Canas-Ortega, Canas-Madueno, & Ruiz-Aviles, 2004; Canas, Ayuga, & Ayuga, 2009; Pflüger, Rackham, & Larned, 2010; Zhao et al., 2013).

2.3. Survey of observers' preference

Each image was printed on an A3-size paper (420 mm × 297 mm) in true color, and the 30 sheets were bound in a book in random order (eight copies of the book were made in total, and all sheets were print by the same printer). The volunteers who were selected randomly in each of the five parks were invited to evaluate these printed photographs by stating their visual preferences. Before the evaluation, a simple set of instructions was read to them. According to his/her own reading time, the participants could turn over the pages of the book freely, and return to any photograph to review or change its rating. Landscape preference was divided into 5 ranks (scores): 1 = "least attractive" to 5 = "most attractive". And the participants were encouraged to use the entire range of the rating scale.

The first evaluation (August 2011) only included 176 participants, this group is small for such research, so the second evaluation was conducted in April 2014, and 306 new participants involved. Because the preference scores between the two evaluations are similar (analyzed by the one-way ANOVA, $F = 0.689$, $p = 0.414$), their data are combined in further analysis. Among the 482 participants in total, 367 persons submitted valid questionnaires (missing the information of demographic characteristics or some picture(s) being omitted from evaluation was considered as invalid questionnaire). The valid questionnaire rate was 76.1%. The demographic characteristics of participants were shown in Table 2. Comparing to demographic groups of Xuzhou population in 2010, the gender groups were similar. The percentage of urban residence of participants during childhood was lower. The reason was related to the urbanization lasting for latest decades in China, which implied that some participants living in urban areas today spent their childhoods in rural area. The participants in our trial were impossible to include the babies and people of over 80 years, who were unable to travel to parks or difficult to evaluate, so the percentages of age groups of participants were different to that of the Xuzhou population. In education groups, because of completing a writing-style questionnaire, the people without schooling were impossible to engage. The percentages of college and post graduate group in samples were