TRANQUILLITY PERCEPTION IN RURAL LANDSCAPE PREFERENCE

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The objective of this research was to identify the factors affecting landscape preference for potential Chinese and English rural tourists through a questionnaire survey and experimental eye tracking methods. The results show that, for the preference of tourists’ home countries’ rural landscapes, tranquillity is the most important predictor for both the English and the Chinese. The dominant factors for Chinese landscape preferences tend towards a vertical dimension in tranquillity, variety, traditional characteristics, and buildings and facilities maintenance, while those for English extend in a lateral dimension of multifaceted maintenance. Regarding the perception of the effect factor of tranquillity, the attention patterns of smaller attention areas, shorter extending radii and fewer attention points are significantly correlated.

Keywords: tranquility, perception, landscape preference, Chinese, English

1. Introduction

“Landscape is an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors” [1]. According to this definition, people are considered the core of a landscape and their perception is an important part of that landscape [2].

Preference, as an expression of human need and desire, has a strong influence on a person’s attitudes towards the landscape. People’s preference for a landscape is grounded in their ability to understand the landscape and the level of complexity and engagement that the landscape offers [3]. Much of the research on landscape preference has focused on residential or neighbourhood settings, urban settings or park settings [4–8]. In recent years, as the adverse social and environmental impacts of increased crowding, noise, air and visual pollution have been detected in urban environments [9;10], a large body of research has been focusing on examining individuals’ perceptions of rural landscapes, where visitors often seek relief from the stresses and strains of everyday life. On a general level, particularly in Western countries, the preference of the general public can be characterized as nature-friendly. The intrinsic value of nature and its subsequent right to exist irrespective of its functions for mankind are largely acknowledged [11]. Simultaneously, landscape preferences have always been found to differ across sociodemographic characteristics. Within this, living environment (urban vs. rural) and education level can significantly affect landscape preference [12]. Rural tourists and farmers,
in particular, are found to have very different preferences [13–15]. Whether the tourists belong to a subculture (either class- or ethnicity-based) also influences their enjoyment of the landscape compared to others [16]. Therefore, a more sophisticated understanding of a certain landscape considering its various potential users is necessary.

In this paper, we aim to examine the effect factors of preference towards rural landscapes from a series of predictors and to assess landscape preference through a questionnaire survey considering both Chinese and English people. An eye-tracking experimental study was then performed with the aim to explore the relationship between the perception of one explored effect factor and one particular soundcape—tranquillity—and people’s attention patterns. In both the questionnaire and the experimental studies, the perspective of the tourist was emphasized.

2. Methodology

2.1 Questionnaire survey

In the first stage, a questionnaire survey was conducted to examine the effect factors of preferences for both Chinese and English potential rural tourists towards their home countries’ rural landscapes. The questionnaire survey was conducted in relatively quiet, public rest spaces at two universities in Sheffield (The University of Sheffield and Sheffield Hallam University) with Chinese and English students. At the beginning of the questionnaire, typical rural landscapes were mentioned to evoke the participants’ prior experiences in the countryside. For example, in the English version of the questionnaire, typical villages located in the Peak District National Park, a rural landscape dominated by heather moorlands and sheep farming [16] that attracts a large number of visitors from urban areas, were presented; in the Chinese version of the questionnaire, a traditional rural landscape characterized by human settlements combined with natural and agricultural landscapes was presented [17].

More specifically, the questionnaire consisted of the importance evaluations of a series of predictors that could affect preference of rural tourism. Most predictors were carefully selected in previous study on rural landscape preference [18; 19]. In addition, valued characteristics in rural landscape experiences were also included, such as tranquillity [20]. They are vegetation, buildings and facilities, openness, tranquillity, maintenance, traditional, agricultural crops, variety and colourful. Corresponding to previous studies [19; 21], a five-point scale ranging from totally unimportant “-2” to very important “2” was used.

2.2 Eye-tracking experimental test

According to the results of the questionnaire survey, the second stage was conducted by eye tracking (a powerful tool for analysing observations of landscapes represented by photographs) to explore the observation patterns of landscapes for the most important factor of rural landscape preferences: tranquillity. In the test, the participants sat in front of the eye tracker in a natural way in the eye tracking laboratory. After a calibration procedure, each participant was asked to view 20 images in a random order, with a prompt of “Please evaluate the landscape presented; is it tranquil or noisy?” The images are reproduced and have been successfully used in the previous study of rural landscape evaluations [22]. Each image was displayed in the screen area of the eye tracker for ten seconds, followed by a ten-second break for an evaluation of tranquillity on a seven-point scale ranging from very non-tranquil “-3” to very tranquil “+3” [22; 23].

A number of basic eye-tracking metrics that provide information about the main observation pattern—fixations, saccades and their properties—can be reflected by heat maps [24; 25] in which the red zones indicate the areas that have been observed the most frequently and intensively, while green presents the least frequently and intensively observed areas, with varying levels in between. Although most previous studies examined the relationship between landscape evaluations and eye-tracking
metrics [22–23; 26–27], the attention patterns analysed through heat maps has not been explored in-depth. Therefore, illustrating the relationship between the evaluation of tranquillity and its attention pattern was the main aim of this eye tracking study. The attention pattern in the heat map of each image was calculated in terms of the total attention area (1+2+…+9), the effective attention radius R and the attention points (separated within attention areas for each image, namely, 9), as seen in Fig. 1, which shows the centres of attention of the entire group of participants for Image C4, where the parameters for the attention pattern are explained.

![Heat map for Image C4](image)

Figure 1. Heat map for Image C4 of the 20 participants with circled attention areas (from yellow to read). The total attention area= S1+2…+9, the effective attention radius R refers to the radius of the extended area resulting from the combination of all separate attention areas, and the attention points signify the numbers of the separated attention areas, namely, nine).

2.3 Participants

The participants in the questionnaire survey were two groups of young people, namely, 83 Chinese and 78 English students who had been living in urban areas and had experience with rural tourism in China and the UK, respectively, and who did not frequently visit rural areas. The Chinese students had been studying in the UK for less than two years. Sampling was selected based on previous studies on rural landscape evaluations [16; 18–19; 27].

Previous eye-tracking studies have indicated that neither nationality nor gender plays a significant role in eye-movement characteristics [28]. Therefore, a homogeneous group was selected to limit bias towards the ages or social and educational backgrounds of the observers. They were 20 university students in China. It is also a method commonly used in similar studies on landscape visual evaluation and eye-tracking tests inside the laboratory [22; 23].

2.4 Reliability analysis

Before processing the results, reliability analysis was performed to assess whether the proposed studies will produce reliable results. For each dimension of the enquiry, inter-rater and intra-class reliability was calculated. The coefficients for the importance evaluations of the predictors for landscape preference and eye tracking results based on the metrics of the total fixations, fixation duration, total gaze points, strict Average-X and strict Average-Y of each landscape type are consistent with the requirements (0.70) and can be acceptable to work with the mean results for further analysis with confidence [29].
3. Results

3.1 The importance of landscape predictors

Fig. 2 compares the evaluated values which the Chinese and English respondents assigned to each of the predictors (vegetation, buildings and facilities, openness, tranquillity, maintenance, traditional, agricultural crops, variety and colourful) for landscape preference in rural tourism. Generally, the evaluations were all above “neutral”, meaning that all the predictors are considerable. More specifically, tranquillity, vegetation, openness and maintenance were more important and had higher evaluations than the other predictors for both Chinese and English; within this, Chinese participants responded more to tranquillity and vegetation, whose evaluations were close to “very important”. In the other aspects, Chinese regarded buildings and facilities and agricultural crops as relatively important, with evaluation scores of 0.61–0.63; the importance of “traditional” and “colourful” were only close to neutral (0.42–0.45). Meanwhile, for the English, the factors traditional, variety and colourful were important (0.73–0.92); buildings and facilities and agricultural crops were relatively less important (0.36–0.55).

![Figure 2. Importance evaluations of the predictors for landscape preference.](image)

To identify statistical differences in the effect factors between Chinese and English, a paired-sample t-test was conducted. There were significant differences (p<0.05) for vegetation and colourful between the Chinese and English. Compared to the English, the Chinese prefer vegetation (by 0.37 on average) and do not expect more colourful landscapes, with lower values of importance (by 0.35 on average).

3.2 The dominate landscape factors

The above results already indicate that Chinese and English tourists do appear to use different criteria when appreciating their home countries’ rural landscapes. To confirm the relationships between the predictors for the Chinese and English participants, a Pearson correlation analysis was performed. Table 1 presents the correlation coefficients between the predictors. According to the results from the Chinese, note that the correlation R of tranquillity, vegetation, openness and traditional characteristics ranges from 0.27 to 0.48 (0.00≤p≤0.01), suggesting that these predictors significantly interact with one another, namely, landscape tranquillity increases, as expected, with increases in the visible area of vegetation and in the degree of openness and traditional characteristics. According to the results from the English, it is interesting to note that, unlike the results of the Chinese participants, the predictors here are more interdependent and interactive, as almost all predictors show statistically significant positive correlations with most of the other predictors. In particular, compared to the Chinese participants, maintenance is much more important to the English participants since it is related to nearly
all of the predictors with strong correlations (0.27 ≤ R ≤ 0.62, 0.00 ≤ p ≤ 0.02), while no significant correlation was found between maintenance and any other predictor in Chinese evaluations.

Table 1: Person correlation coefficients between predictors, based on the Chinese/English participants’ evaluations

<table>
<thead>
<tr>
<th>Vegetation</th>
<th>Building and human constructions</th>
<th>Openness</th>
<th>Tranquility</th>
<th>Maintenance</th>
<th>Traditional</th>
<th>Agricultural crops</th>
<th>Variety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building and human constructions</td>
<td>0.04/0.01</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Openness</td>
<td>0.10/0.45**</td>
<td>0.05/-0.02</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Tranquility</td>
<td>0.38**/0.32**</td>
<td>-0.01/-0.01</td>
<td>0.48**/0.36**</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Maintenance</td>
<td>0.03/0.29**</td>
<td>0.13/0.21</td>
<td>-0.02/0.29*</td>
<td>-0.01/0.39**</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Traditional</td>
<td>0.07/0.36**</td>
<td>0.09/0.06</td>
<td>0.20*/0.40**</td>
<td>0.27*/0.32**</td>
<td>0.07/0.48**</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Agricultural crops</td>
<td>0.08/0.50**</td>
<td>-0.12/0.10</td>
<td>0.05/0.38**</td>
<td>0.03/0.12</td>
<td>-0.12/0.38**</td>
<td>0.23*/0.62**</td>
<td>—</td>
</tr>
<tr>
<td>Variety</td>
<td>0.18/0.48**</td>
<td>-0.02/-0.06</td>
<td>0.22*/0.44**</td>
<td>0.17*/0.27*</td>
<td>0.08/0.34**</td>
<td>0.18/0.36**</td>
<td>0.20/0.54**</td>
</tr>
<tr>
<td>Colourful</td>
<td>0.21*0.21</td>
<td>-0.05/-0.10</td>
<td>0.21*/0.31**</td>
<td>-0.02/0.26*</td>
<td>0.11*0.18</td>
<td>0.07/0.21</td>
<td>0.10/0.18</td>
</tr>
</tbody>
</table>

**p < 0.01; *p < 0.05.

To reveal the main landscape factors that influence landscape preference, a factor analysis was performed using both the Chinese and English importance evaluations. As shown in Table 2, four and two categories of landscape factors were revealed for the Chinese and English landscape preferences, respectively. For the Chinese, factor 1 is mainly associated with tranquillity, openness and vegetation, which are also the predictors with the highest levels in the importance evaluations; factor 2 is generally associated with diversity, including colourful and variety; factor 3 is mostly associated with traditional characteristics, for example, agricultural landscapes; and factor 4 is mainly focused on buildings and facilities and their maintenance. Correspondingly, from the factor categories based on the English data, it is interesting to note that factor 1 includes most of the predictors and principally relates to the factor of multiple direction maintenance while colourful and buildings and facilities have been drawn for the second category as factor 2. Comparatively speaking, the dimensions on landscape preference are different between the Chinese and English according to the corresponding effect factors. The dimension for the Chinese tends towards vertical extension; combined with the results in Table 1, the dominant factors generally relate to tranquillity, landscape variety, traditional characteristics, and the maintenance of buildings and facilities. The landscape preference for the English, however, is extended in the lateral dimension; namely, people are mostly concerned with multifaceted maintenance, focused on various rural landscape characteristics in terms of traditional, natural, variety, and tranquillity, etc.

Table 2: Factor analysis of the predictors for landscape preferences for the Chinese and English, respectively

<table>
<thead>
<tr>
<th>Index</th>
<th>Factors—Chinese</th>
<th>Factors—English</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tranquillity</td>
<td>1(19.00%)</td>
<td>2(17.57%)</td>
</tr>
<tr>
<td>Openness</td>
<td>0.89</td>
<td>-0.08</td>
</tr>
<tr>
<td>Vegetation</td>
<td>0.68</td>
<td>0.12</td>
</tr>
<tr>
<td>Colourful</td>
<td>0.59</td>
<td>0.28</td>
</tr>
<tr>
<td>Variety</td>
<td>0.07</td>
<td>0.87</td>
</tr>
<tr>
<td>Traditional</td>
<td>0.18</td>
<td>0.77</td>
</tr>
<tr>
<td>Agricultural crops</td>
<td>0.24</td>
<td>0.00</td>
</tr>
<tr>
<td>Building and human constructions</td>
<td>-0.08</td>
<td>0.21</td>
</tr>
<tr>
<td>Maintenance</td>
<td>0.04</td>
<td>-0.16</td>
</tr>
</tbody>
</table>

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3.3 Landscape factor and its attention pattern

The results of Section 3.1-3.2 both indicate that, for English and Chinese rural tourists, tranquillity is the most important factor affecting landscape preference. Therefore, there appears to be a need to understand how people perceive and observe landscapes during tranquillity evaluations. In contrast to previous studies, which have mainly focused on eye-tracking metrics and sound direction [22;23], the visual attention parameters in heat maps for each image for 20 participants were considered and calculated in this study, including the attention area (account for the whole area of the image) (%), the attention radius (account for the long axis of the image) (%), the attention points separated within attention areas, and the tranquillity evaluations.

Correspondingly, Table 3 presents the results of correlation analysis between the evaluation of tranquillity and the parameters for the attention pattern, where a Kendall’s Tau statistic was used based on a previous study [18]. Of note, there are negative correlations between tranquillity evaluations and the parameters of attention areas, suggesting that the evaluation of tranquillity decreases with the growth of the entire attention areas, the extension of the observed radius and the increase in the number of the focused attention points. Therefore, it might be concluded that the landscapes (with attractive objects) that formed smaller attention areas and facilitated fixation on concentrated areas can be perceived as more tranquil, while complicated landscape elements, especially those that show more interactions and are occupied by larger areas, decrease the perception of tranquillity. This result may be because the landscapes with fixed and concentrated attention patterns could lead people to immerse themselves in the landscapes and experience tranquillity psychologically.

Table 3: Correlation analysis between tranquillity evaluations and the parameters of attention patterns (Kendall’s tau statistic), where the significance levels (2-tailed) are also shown

<table>
<thead>
<tr>
<th>The parameters of attention patterns</th>
<th>Attention area (%)</th>
<th>Attention radius (%)</th>
<th>Attention points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient</td>
<td>-0.15**</td>
<td>-0.15**</td>
<td>-0.10**</td>
</tr>
<tr>
<td>Significance</td>
<td>0.00</td>
<td>0.01</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**p < 0.01.

4. Conclusions

For the perception of their home countries’ rural landscapes, it has been shown that in a series of predictors, tranquillity, vegetation, openness and maintenance are the most important predictors for both groups.

The correlations between the predictors for the two groups are rather different. Further analysis of the survey results suggests that the dimensions of dominant factors on landscape preference are different between Chinese and English. The dimension for the Chinese tends towards vertical extension, relating to tranquillity, landscape variety, traditional characteristics, and the maintenance of buildings and facilities. The factors for the English, however, are extended in a lateral dimension of multifaceted maintenance focused on various rural landscape characteristics in terms of traditional, natural, variety, and tranquillity.

For the perception of the effect factor of tranquillity (without sound stimuli), the attention patterns of smaller attention areas, shorter extending radii and fewer attention points are significantly correlated. Therefore, the landscapes with attractive objects that facilitated participant fixation on relatively concentrated attention areas can contribute to the perception of tranquillity.
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