Residents' Perception of the Recreational Value of Forest Parks: A Case Study in Shanghai, China

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Abstract: Forest parks provide important recreational and tourism benefits to residents, so it is essential to know what residents' perceptions are regarding the recreational value of forest parks for participatory forest planning and management. This study investigated forest park recreational value in the physical, psychological, and social dimensions in Shanghai according to questionnaires completed by 658 respondents, and examined the relationships between recreational value and residents' social variables by multiple correspondence analysis (MCA). The results show the following: 1) The recreational value of forest parks is perceived as most important in the psychological dimension, while in the social dimension it is appreciated the least. 2) In terms of the differences in forest park recreational value in suburbs and rural areas, the social value in rural areas had significantly higher scores than in the suburbs, and the psychological value in suburbs is much higher than that in the rural areas. 3) Regarding the social variables which characterize residents in suburbs and rural areas, females and younger groups tended to assign higher scores to recreational value than males and older groups. Moreover, citizens with low education or low income also assigned higher scores to recreational value compared to more educated or higher-income residents. The results of this study reveal the recreational value characteristics of Shanghai forest parks in the three dimensions, which can provide a scientific basis for the sustainable development of urban forest resources and contribute to reasonable planning and management.

Key words: forest park; multiple correspondence analysis; recreational value; social perception

1 Introduction

As a significant type of Cultural Ecosystem Services (CES), forests within cities provide important recreational and tourism benefits around the world (MEA, 2005; Rantala, 2010; Paracchini et al., 2014; Taye et al., 2019). With the rapid urbanization in the past few decades, the proportion of the world population living in cities has reached 55.3% in 2018 (UN, 2018). Due to limited land resources and the environmental carrying capacity overdraft in built-up areas, cities often cannot provide sufficient outdoor recreational opportunities for residents which keep pace with the increase of the urban population (Kabisch and Haase, 2013; Gu et al., 2017; Ohe et al., 2017). This has led urban pol-icy-makers to attach more importance to forest resources, such as forest parks in suburban and rural areas, as solutions (Jay and Schraml, 2013; Gong et al., 2015).

Forest parks are located on the outskirts of cities and they rely on the forest natural landscape, provide residents with forest recreational activities, focus on engagement with nature, yield opportunities for connections and govern the interaction between urban forest ecosystems and people (Arnberger, 2006; Daniel et al., 2012; Chen and Nakama, 2013; Huang, 2014; Luo et al., 2016). The recreational functions of forest parks can be divided into three categories, namely, physical, psychological, and social (Bell et al., 2009; Gouveia et al., 2014; Zhai et al., 2018), so the correspond-

ing recreational value of forest parks also has physical, psychological, and social dimensions (Zandersen et al., 2007; Lupp et al., 2016; Cohen-Hattab et al., 2018).

The knowledge of forests among residents can assist policy-makers in achieving effective management and maintenance of forest parks, so it is important to analyze the public's perceptions during participatory forest planning and management (Hu and Ritchie, 1993; Lee et al., 2010; De Meo et al., 2015). Hence, evaluating residents' perceptions of forest park recreational value is key to generating suggestions for forest park planning and design (Carson et al., 2015; Chen et al., 2018). Numerous studies have been devoted to individual perceptions of natural resource value (Matsiori et al., 2012; Pirikiya et al., 2016; Bratman et al., 2019). For example, the perceptions and preferences of residents for the functions of forest parks will inform decision-makers (Dhami et al., 2014; Huang, 2014), and the awareness of particular landscape characteristics of urban green spaces among residents were investigated by principal components analysis (Zhang et al., 2013). The significance of residents' perceptions of the recreational value of urban community parks was examined using important performance analysis (Yu et al., 2018). Social preferences and perceptions of forest value in mountain and urban communities were analyzed by a questionnaire (Paletto et al., 2013; De Meo et al., 2015).

But most studies investigating the recreational value of forest parks have focused on the overall recreational value (Bateman and Jones, 2003; Nielsen et al., 2007; Zandersen and Tol, 2009; Liu et al., 2019). Bateman and Jones (2003) created various meta-analysis models of the recreational value of woodlands. In another meta-analysis of forest recreational value, Zandersen and Tol (2009) reduced differences across studies as much as possible by selecting the specific types of recreational activities. However, due to the lack of subdivisions of the recreational value in these studies, residents' awareness of the forest recreational value was not accurately captured. Therefore, it is necessary to explore the recreational value of forest parks in different dimensions.

Generally, a review of the existing literature shows that more attention has been paid to forest parks either in rural areas (Zandersen et al., 2007; Lupp et al., 2016; Liu et al., 2019) or the suburbs (Carson et al., 2015; Chen et al., 2018), while less attention has been paid to the differences between the forest parks in these areas. Bateman and Jones (2003) confirmed that there is significant variation between survey site locations in terms of the forest recreational value. According to the distances between the locations of their residences, Zhang et al. (2015) classified forest park residents into two types, local and nonlocal, and demonstrated significant differences. The question of whether preferences for forest parks are different for residents in the suburbs compared to rural areas was given special attention in this study.

Nowadays, some studies investigate preferences for forest parks in relation to individual social variables. Van den Berg and Koole (2006) illustrated how the factors of location, age, social status, political party preference, and recreational motives had correlations with relative perceptions for wild and managed nature. At the same time, some studies have shown that demographic and socioeconomic factors of residents might affect their perceptions of the recreational value of forest parks, such as gender, monthly income, education, and where they live (Paletto et al., 2013; Zhang et al., 2013). However, different studies produced dissimilar results. For instance, Zhang et al. (2013) proposed that different genders assigned different scores for the recreational value according to their age, while Paletto et al. (2013) claimed that males assigned higher recreational value scores than females. Liu et al. (2019) pointed out that the recreational value was negatively correlated with income, but was positively correlated with age, location of residence and length of stay. However, Paletto et al. (2013) stated that higher recreational value was attributed by the intermediate age class. Previous studies have paid attention to the overall recreational value of forests; yet the correlation between recreational value in different dimensions and residents' social variables still need to be examined.

This study was conducted in Shanghai's forest parks to address these questions, and had three objectives: 1) Investigating forest park recreational value in the physical, psychological, and social dimensions; 2) Identifying the differences in forest park recreational values in suburban and rural areas; and 3) Examining the possible relationships between the forest park recreational value and social variables of the residents such as gender, age, income, and education. The results of this study can provide a reference for the sustainable development of urban forest resources and contribute to reasonable planning and management.

2 Materials and methods

2.1 Study area

Shanghai is located in the middle of the East China (30°40′ N –31°53′ N, 120°51′ E–122°12′ E), which is also the center of the metropolitan Yangtze Delta. By the end of 2017, Shanghai had a population of about 24.18 million, with a density of 3822 people km^{-2}, and the per capita green area was 8.1 m^2 in the urban centers (SMSB, 2018). There were more than 10000 annual residents per hectare of urban parks, which approached or exceeded the carrying capacities of the parks. As the space for recreational activities in urban parks has already faced restrictions and the needs of residents for leisure and recreation have sharply increased, it is necessary to exploit more recreational resources and space (Zhang et al., 2019). Therefore, in recent years, the afforestation of forest parks in Shanghai has progressed rapidly, and the primary conditions for recreation have been established, which should help to expand residents' recreational activi-

ties and reduce the recreational load of urban public green spaces.

The forest resources of Shanghai include four national forest parks (Gongqing, Sheshan, Haiwan, and Dongping National Forest Parks), the greenbelt around the Outer-Ring Highway, and some forests in the suburbs and rural areas. The greenbelt in Shanghai, which is comprised of more than 10 recreational parks, was established in 1995 and encircles an area of 62 km². Gucun Country Forest Park is one of the earliest constructed recreational parks with the largest area. To satisfy the rapidly increasing outdoor recreational needs of residents, 21 country parks were established from 2013 onwards with a total area of 400 km². As of 2018, seven country parks have finished the first phase of construction,

including Pujiang Country Forest Park and six other country parks characterized by wetlands, culture, and idyllic scenery.

This study investigated the recreational values of six forest parks in Shanghai. The forest parks include the four national forest parks listed above and two country forest parks (Gucun and Pujiang Country Forest Parks), which were completed in 2017. Of the six forest parks, three are in the suburbs (Gongqing National Forest Park, Gucun Country Forest Park, and Pujiang Country Forest Park) and three are in rural areas (Sheshan National Forest Park, Haiwan National Forest Park, and Dongping National Forest Park). The area and year of creation of each park is shown in Table 1, while Fig. 1 shows the spatial layout of the six forest parks.

Table 1　Forest parks selected in the suburbs and rural areas of Shanghai

| Location type	Forest park	Park area (ha)	Year opened	Questionnaire number	Number of valid respondents
Suburban	Gongqing National Forest Park	131	2005	100	87
Suburban	Gucun Country Forest Park	350	2011	100	95
Suburban	Pujiang Country Forest Park	582	2017	190	174
Rural	Sheshan National Forest Park	401	1993	120	95
Rural	Haiwan National Forest Park	433	2004	140	113
Rural	Dongping National Forest Park	355	1993	100	94
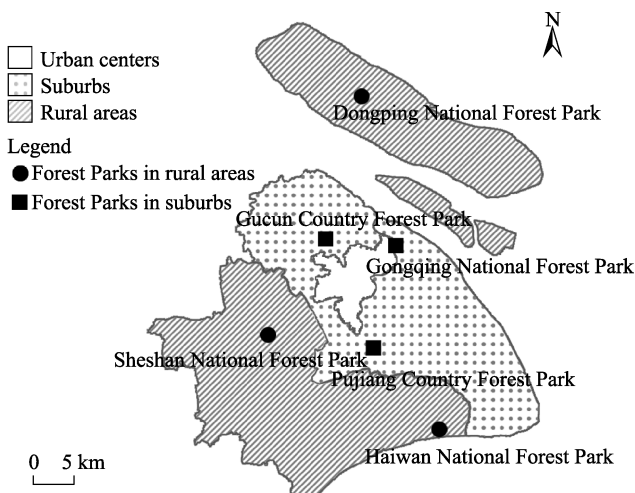
Fig. 1　Sites of forest parks selected in the suburbs and rural areas of Shanghai

2.2　Sampling and surveys

Resident perceptions of the recreational value of forest parks in the three dimensions were identified using questionnaires. The questionnaires were distributed to 750 residents randomly in the selected forest parks from July 2018 to April 2019, producing 658 valid responses — 356 and 302 in suburban and rural areas, respectively (Table 1).

The questionnaires focused on the individual percep-

tions of recreational value formed by residents to the forest parks. Respondents were asked to complete the questionnaire and return it to the investigators on the spot to maximize validity.

2.3　Questionnaire design

The questionnaire items were grouped into four thematic sections: recreational resources, recreational perception, recreational facilities, and personal information. This article focuses on the questions related to the recreational perception section of the questionnaire, which aimed to assign scores to the forest park recreational value in the three dimensions. From the literature review, the physical, physiological, and social dimensions of the forest parks can be expressed as described in Table 2.

Psychological value can provide residents with opportunities for enjoying nature, creating works of art, and enhancing their scientific knowledge.

Physical value can provide residents with opportunities for outdoor recreational activities, getting exercise, and conducting exploratory and training activities.

Social value can provide residents with opportunities for enhancing social interaction and promoting family interaction.

In the recreational perception section, the question "What kind of activities or experiences would you want to have in forest parks?" was investigated by seven specific questions about feelings or preferences as related to recreational activities:

Table 2 Categories of forest park recreational value

Category	Classification	Description
Psychological	Enjoying nature	A place where residents can be close to nature and perceive the scenery
Psychological	Artistic creation	A site to create artistic works, such as photographs or paintings
Psychological	Acquiring knowledge	A place for residents to acquire scientific knowledge
Physical	Physical exercise	A field in which to conduct physical exercise
Physical	Exploration activity	A place where residents can engage in exploratory activities
Social	Social interaction	An occasion for social interaction
Social	Family interaction	A site to hold a family gathering

1) How do you feel about enjoying nature? 2) How do you feel about artistic creation? 3) How do you feel about acquiring scientific knowledge? 4) How do you feel about physical exercise? 5) How do you feel about exploration activities? 6) How do you feel about social interaction? and 7) How do you feel about family interaction?

Residents were asked to rate the importance of recreational activities on a 5-point Likert scale (0 = lowest level of importance; 5 = highest level of importance).

The residents' social variables, including gender, age, education, and income, were also analyzed by a correspondence analysis with the perception of forest park recreational value, which was reflected in the scores assigned by the residents. The personal information of residents was investigated using single choice questions.

2.4 Data analysis

The reliability of the scales was estimated using Cronbach's alpha. In general, Cronbach's alpha should be higher than 0.7 to ensure reliability. Using SPSS 23.0 (International Business Machines Corporation, Armonk, New York, USA) in Windows, the Cronbach's alpha of scales from the completed questionnaires was 0.718, with seven items showing preferences for recreational value. Therefore, the use of the scales in this study was suitable for estimating residents' perceptions.

2.4.1 Differences between suburbs and rural areas

The difference between forest recreational values in the suburbs and rural areas was analyzed by multivariate analysis of variance (MANOVA), and the differences in recreational values in different dimensions (categories) or classifications were analyzed by Pearson's Chi-squared test.

2.4.2 Relationship between recreational value and resident social variables

Multiple correspondence analysis (MCA) is a statistical method that supports the analysis of an association between two or more qualitative variables. The main purpose of MCA is to reduce the dimensionality of a data matrix so that it can be visualized in a subspace of low dimensionality, like principal component analysis. The computing of the coordinates of the qualitative variable categories is allowed by a series of transformations, but a criterion based on inertia is optimal for the coordinates of the observations in the space (Nenadić and Greenacre, 2007). MCA has been recognized as the most appropriate technique for determining the relationships between diverse variables (Paletto et al., 2013).

The responses on forest park recreational values (psychological, physical, and social values) were analyzed according to the social variables of the respondents (gender, age, income, and education) by MCA. Based on the distribution of value scores assigned to forest park recreational functions, the value scores were reclassified into three levels (Paletto et al., 2013): good (4.1 to 5.0), sufficient (3.1 to 4.0) and insufficient (0 to 3.0).

All of the above analyses were done in RStudio 2.3-1 (R Studio, Boston, Massachusetts, USA) in Windows by vegan package version 2.5-4, stats package version 3.5.3, and ca package version 0.71.

3 Results

3.1 Sample characteristics

The valid response rate was 87.7%, with 658 questionnaires collected and processed. Of the respondents, men (309) made up 47% and women (349) accounted for 53% (Table 3). Meanwhile, a correlation analysis found that gender was not significantly correlated with the location of parks that people chose: $\chi^2 = 3.35$, $P = 0.06$. These results suggest that men and women have no special preferences for forest parks in the suburbs or rural areas.

Five age classes were considered: <18, 18–44, 45–59, 60–74, and >75 years old. The age class 18–44 (68%) was the largest, followed by 45–59 (17%). In contrast, the elderly group (over 75) was represented by just 1% of the population sample (Table 3). Through a correlation analysis, age class was significantly correlated with the location of parks that people chose: $\chi^2 = 40.85$, $P < 0.001$. Therefore, it was obvious that the various age groups have different preferences for forest parks in suburbs or rural areas.

As far as the education and income of respondents are concerned, most residents reported above-average education and earnings. To be more specific, most respondents had a junior college or college degree (56%); and people with high school or vocational school degrees (28%) came next (Table 3). Meanwhile, respondents earning 3000–5000 yuan month^{-1} were most common, making up 34% of the total, while people earning 5000–10000 yuan month^{-1} (28%) ranked second (Table 3). In the correlation analysis, education class was significantly correlated with the location of

parks that people chose: $\chi^2 = 4.59$, $P = 0.03 < 0.05$. There were significant income differences between respondents in the suburbs and rural areas: $\chi^2 = 9.97$, $P = 0.04 < 0.05$. Therefore, it was suggested that diverse education and income groups had different preferences for forest parks in the suburbs or rural areas.

Table 3 Sample distribution by gender, age, education, and income (658 respondents)

Social variables	Category	Suburbs	Rural areas	Total number
Gender	male	155	154	309
	female	201	148	349
Age	<18	29	9	38
	18–44	208	242	450
	45–59	69	39	108
	60–74	42	11	53
	>75	8	1	9
Education	Primary or below	4	5	9
	Middle school	44	19	63
	High school or vocational school	97	86	183
	Junior college or college	195	172	367
	Postgraduate	16	20	36
Income	<1500 yuan month^{-1}	52	21	73
	1500–3000 yuan month^{-1}	48	44	92
	3000–5000 yuan month^{-1}	114	111	225
	5000–10000 yuan month^{-1}	98	87	185
	>10000 yuan month^{-1}	44	39	83

3.2 Forest park recreational value in the three dimensions

Table 4 shows the mean values of the different dimensions of recreational value in forest parks and the differences between the suburbs and rural areas, as expressed by residents. The social value of forest recreational functions, which are concerned with the betterment of relationships among colleagues, friends, and family derived from social community and family activities, obtained the lowest score (3.34). The middle score (3.44) was assigned to the physical value, which is linked to the positive effects of a forest as a place for physical exercise. The psychological value was rated highest (3.72), indicating the importance of a forest for providing citizens with relaxation or leisure in nature.

Regarding the further classification of the psychological value, a place where residents can be close to nature and enjoy the scenery ranked first (4.30 ± 0.80), and a site for creating artistic works such as photographs or paintings

came next (3.67 ± 0.95). The lowest values were found for a place for residents to acquire scientific knowledge (3.18 ± 1.04). Regarding the psychological value, there were differences between the suburbs (3.75) and the rural areas (3.68), and the suburbs had significantly higher scores than rural areas ($P < 0.001$). More specifically, enjoying nature scored significantly higher in the suburbs (at 4.35 and 4.25 in the suburbs and rural areas, respectively; $P < 0.001$), and acquiring scientific knowledge was given significantly more importance in the suburbs (3.31) than in rural areas (3.03) ($P < 0.001$). Moreover, artistic creation was assigned a higher score in rural areas (3.76) than in the suburbs (3.60), but there was not a significant difference between these two ($P > 0.05$).

As for the classification of physical value, a field in which to do physical exercise ranked higher (3.56 ± 0.92) than a place where residents can engage in exploratory activities (3.32 ± 1.03). Physical exercise scored higher in rural areas than in the suburbs (3.65 and 3.49, respectively), but the difference was not significant ($P > 0.05$). However, exploration activities were assigned a significantly higher score in the suburbs (3.48) than in rural areas (3.13) ($P < 0.001$). This means that residents in the suburbs are more likely to carry out exploration activities in forest parks.

Referring to the classification of social value, an occasion for social interaction received an intermediate score of 3.24 ± 0.98, while a site to hold a family gathering scored relatively higher (3.45 ± 0.96). As for the differences in the social value between the two types of sites, rural areas gained significantly higher scores than suburbs (3.46 in rural areas, 3.25 in the suburbs; $P < 0.05$). Social interaction and family interaction both scored higher in rural areas than in the suburbs (3.32, 3.59 in rural and 3.16, 3.33 in suburban areas), but family interaction was significantly higher in rural areas ($P < 0.05$). These findings mean that residents in rural areas prefer the social value of forest parks, and are more concerned about family activities.

In terms of the differences in scores given by residents in the suburbs and rural areas (Table 4), each location had attractive characteristics. Residents going to forest parks in rural areas preferred family interactions in the forest parks. By contrast, enjoying nature, acquiring knowledge, and exploratory activities were more prevalent in urban forest parks in the suburbs. Nevertheless, a majority of respondents expressed their preference for a chance to enjoy nature, whether in the suburbs or in rural areas, and the scores for enjoying nature were significantly higher than the other scores: $\chi^2 = 319.17$, $P < 0.005$. On the whole, the differences in forest park recreational value scores between the suburbs and rural areas were significant ($R^2 = 0.027$, $P < 0.005$) according to the multivariate analysis of variance for distance matrices in R.

Table 4   Mean values of the three dimensions of recreational value in the suburbs and rural area forest parks assigned by residents

Category	Classification		Total	Suburbs	Rural areas	χ^2	P-value
Psychological value	Enjoying nature	Mean	4.30	4.35	4.25	**18.479**#	<0.001***
		Std.Dev.	0.80	0.85	0.73		
	Artistic creation	Mean	3.67	3.60	3.76	6.771	0.149
		Std.Dev.	0.95	0.98	0.90		
	Acquiring knowledge	Mean	3.18	3.31	3.03	**26.431**#	<0.001***
		Std.Dev.	1.04	0.98	1.09		
	Average		3.72	3.75	3.68	**20.448**#	0.040*
Physical value	Physical exercise	Mean	3.56	3.49	3.65	5.694	0.223
		Std.Dev.	0.92	0.94	0.88		
	Exploration activity	Mean	3.32	3.48	3.13	**29.341**#	<0.001***
		Std.Dev.	1.03	0.94	1.09		
	Average		3.44	3.49	3.39	13.727	0.089
Social value	Social interaction	Mean	3.24	3.16	3.32	8.259	0.083
		Std.Dev.	0.98	0.99	0.97		
	Family interaction	Mean	3.45	3.33	3.59	**13.606**#	0.009**
		Std.Dev.	0.96	1.00	0.90		
	Average		3.34	3.25	3.46	**32.264**#	<0.001***

Note：# means more important differences are marked in bold；Differences between suburbs and rural areas are statistically significant at $P < 0.05$ (*), $P < 0.01$ (**), and statistically highly significant at $P < 0.001$ (***).

3.3   Correspondence analysis between forest park recreational value and resident social variables

3.3.1   Correspondence analysis of all respondents

The MCA of forest park recreational value indicated a difference between males and females, with the former giving lower scores to each value; statistical inertia accounted for 84.2% (see Fig. 2). The MCA of the age groups illustrated that the highest scores were in the youngest age class (<18), the lowest scores were in older people (60–74 and >75), and intermediate scores were given by the middle-aged classes (18–44, 45–59). These results showed a decreasing trend of forest park recreational value scores assigned from younger groups to older groups, with a percentage of inertia of 84.9%. Comparing forest recreational value for groups with different educational backgrounds, the MCA demonstrated that the group with primary school education or below tended to assign higher scores to forest park recreational value, and the middle schooling group assigned the lowest scores, with a statistical inertia of 80.8%. The MCA of income groups showed that the highest scores were assigned by the two low-income classes (<1500 yuan, 1500–3000 yuan), the lowest scores were given by the group which received 5000–10000 yuan, and intermediate scores were given by the other two classes (3000–5000 yuan, >10000 yuan). There was no obvious tendency in the results for forest park recreational value scores between different income groups. However, when the individual income of residents was under 10000 yuan, then the higher the income the lower the forest recreational value score, with a percentage of inertia of 86.3%.

3.3.2   Correspondence analysis of respondents in the suburbs

As indicated in the MCA, the difference between men and women was not significant in terms of the scores assigned to each value; statistical inertia accounted for 80.2% (see Fig. 2). Regarding age groups, it seems that in suburban forest parks, the middle-aged class (45–59) tended to assign the highest scores and the youngest class (<18) the lowest scores. These results showed no obvious trend for forest park recreational value scores according to age groups, with a percentage of inertia of 80%. Regarding forest park recreational value among different education groups in the suburbs, the MCA illustrated the highest scores from the junior college or college group, and the lowest scores from the middle schooling group, with a percentage of inertia of 77.8%. The MCA of groups with various income levels showed that the highest scores were assigned by the low-income classes (1500–3000 yuan and <1500 yuan), the lowest scores were given by the high-income classes (5000–10000 yuan and >10000 yuan), and intermediate scores were given by the medium-income residents (3000–5000 yuan). These results showed an increased trend in forest park recreational value scores from low-income groups to high-income groups, with a percentage of inertia of 81.0%.
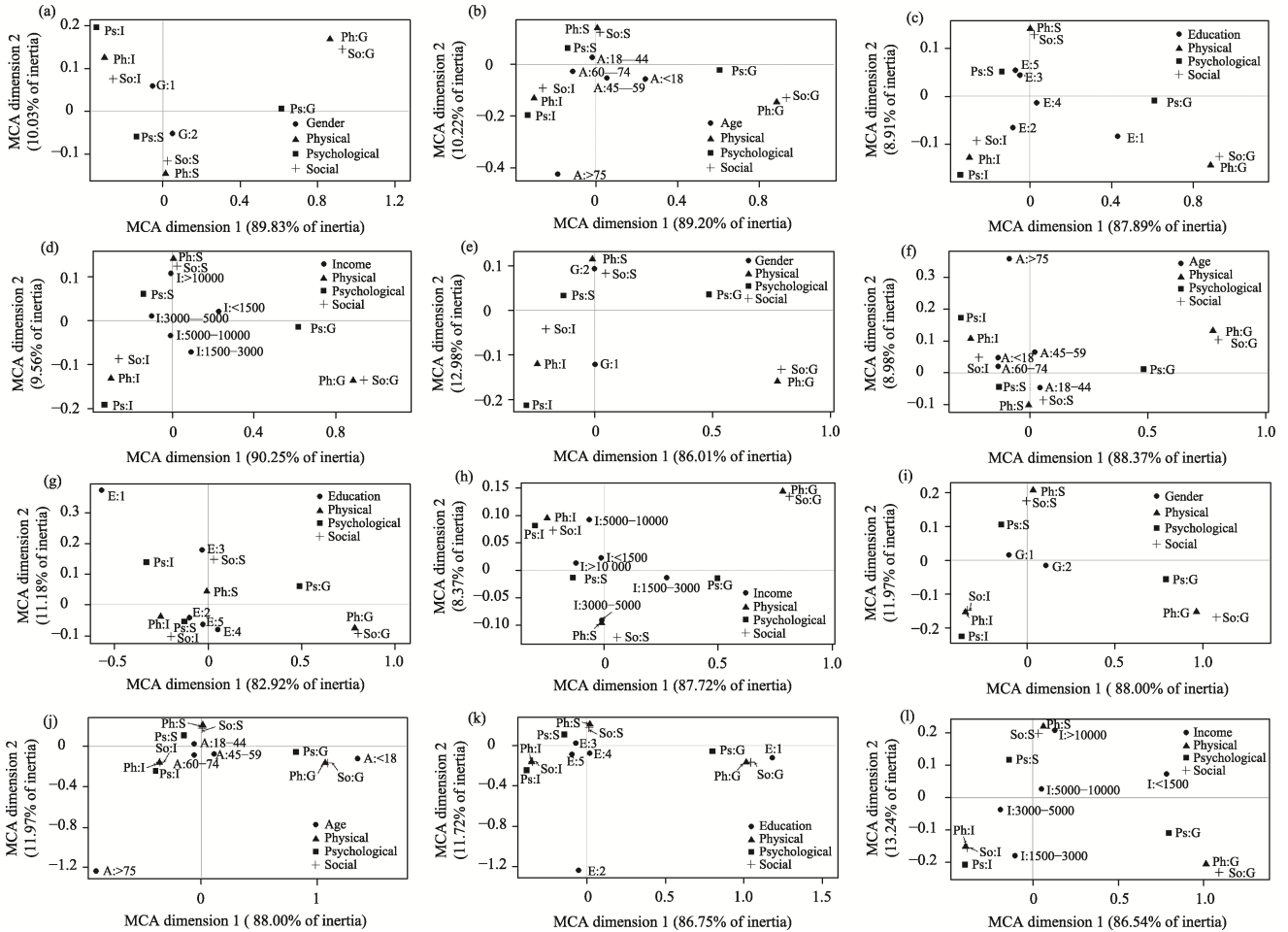
Fig. 2 Multiple correspondence analysis (MCA) maps for gender, age, education, and income vs. forest park recreational value assigned by all respondents (a-d), by respondents in the suburbs (e-h), and by respondents in rural areas (i-l)

Note: Ph, Ps, and So symbolize the physical, psychological, and social values, respectively. I, S, and G indicate insufficient, sufficient, and good values. G:1 and G:2 symbolize gender: Males and females, respectively. A: <18, A: 18–44, A: 45–59, A: 60–74, and A: >75 symbolize age classes of <18, 18–44, 45–59, 60–74, and >75, respectively. E:1, E:2, E:3, E:4, and E:5 symbolize education groups: Primary or below, middle school, high school or vocational school, junior college or college, and postgraduate, respectively. I: <1500, I: 1500–3000, I: 3000–5000, I: 5000–10000, and I: >10000 symbolize income groups: <1500 yuan month^{-1}, 1500–3000 yuan month^{-1}, 3000–5000 yuan month^{-1}, 5000–10000 yuan month^{-1}, and >10000 yuan month^{-1}, respectively. Dimension 1 represents the correspondence of recreational values assigned to forest parks; The correspondence of the social variables of residents is represented in dimension 2.

3.3.3 Correspondence analysis of respondents in rural areas

The MCA of resident recreational value scores for rural areas and forest parks also produced diverse results. However, in contrast to the results of suburbs, females in rural areas tended to assign more importance to each value, similar to the result of all respondents, with a statistical inertia accounting for 86.9% (see Fig. 2). Reflecting forest park recreational value to different age groups, the highest scores were given by the youngest age class (<18), and lower scores by older people (60–74 and >75). These results showed a decreasing trend for forest park recreational value scores from younger groups to older groups, with a percentage of inertia of 89.5%. As for forest park recreational value to different educational groups, the group with primary school education or below tended to assign higher

scores to forest park recreational value and the middle schooling groups gave the lowest scores, with a percentage of inertia of 82.2%. Regarding the different income groups, the highest scores were assigned by the lowest-income class (<1500 yuan), the lowest scores were given by the moderate income groups (with incomes of 1500–3000 yuan and 3000–5000 yuan), and intermediate scores were given by the high income classes (5000–10000 yuan and >10000 yuan). This means that residents with high income in rural areas were more likely to be indifferent about the value, with a statistical inertia of 89.8%.

4 Discussion

4.1 Recreational value in the three dimensions

The categorization of recreational value clearly shows that there are differences between the psychological, social, and

physical values. Psychological value ranked highest among the three dimensions, followed by physical value, while social value ranked last. The significance of forest park recreational value in terms of giving the public opportunities to relax in nature has been confirmed (Ohe et al., 2017; Cohen-Hattab et al., 2018), so policy-makers and park designers should pay attention to better management of forest parks to provide greater psychological value.

Enjoyment of nature received the top scores in terms of psychological value and all seven of the subgroups of recreational value. Acquiring knowledge ranked last in terms of psychological value and all classifications of recreational value. Artistic creation ranked as the second of the three dimensions of recreational value. The classifications scoring first (enjoying nature) and second (artistic creation) both belonged to the psychological value dimension. There was also a trend for individuals who tend to spend more time in nature to mention appreciation (Bratman et al., 2019) or artistic creation (Bell et al., 2009). Therefore, better planning of natural resources to provide residents with opportunities for enjoying nature and creating arts is more important for the recreational management of forest parks.

4.2 Differences in recreational value between the suburbs and rural areas

The survey clearly shows that individuals from different locations have diverse perceptions of the forest recreational value (Huang, 2014; Carson et al., 2015). Overall, psychological and social values were significantly different between the suburbs and rural areas. More specifically, residents in the suburbs attached more importance to psychological value, while those in rural areas focused more on social value, which means residents who go to suburban forest parks likely want to relax and regulate their mental health. Indeed, it has been proven that nature has a significant influence on mental health. Our study demonstrated that residents in Shanghai recognized this and chose to relax in nearby forest parks in the suburbs. On the other hand, residents going to forest parks in rural areas planned social occasions there, likely due to the better natural environment and more abundant open spaces.

Other differences in recreational value at the classification level were significant between the suburbs and rural areas, aside from the scores for artistic recreation, physical exercise, and social interaction. For example, residents who went to the suburbs paid more attention to getting close to and acquiring knowledge of nature, likely due to the better recreation and science education facilities in suburban forest parks. On the other hand, residents who went to rural areas cared more about family interactions and found these forest parks more suitable for parent–child activities. Above all, this study offers insight into the differences in recreational value between suburbs and rural areas, and it can provide targeted suggestions for site layout and recreation facility

configurations of forest parks in different locations.

4.3 Resident social variables affect forest park recreational value

Studies have shown that gender is significantly correlated with recreation demands for green space. According to Zhang et al. (2013), the different genders assigned different scores to recreational value. In this study, females gave higher scores to forest recreational value than males, and females in rural areas tended to assign more importance to recreation than males, while there was no significant difference in the suburbs. Therefore, it is clear that forest park designers need to pay more attention to women in rural areas to be sure that their needs are met.

In terms of the relationship between age and recreational value, younger groups tended to assign higher scores to the three dimensions than older respondents. However, different studies have produced conflicting results. For example, according to Paletto et al. (2013) and Zhang et al. (2013), the intermediate age class has the highest degree of recreational demand, but Van den Berg and Koole (2006) reported that younger respondents assigned higher scores to recreation. Due to insufficient recreational space in the urban center, young people in Shanghai, whether on their own or accompanied by their families, choose to go to forest parks for recreational activities. Therefore, it is suggested that forest park designers in rural areas should pay more attention to young age groups for this reason.

As for the education variable, groups with primary school education or below tended to assign higher scores to forest recreational value. These results confirmed those from Paletto et al. (2013) and Zhang et al. (2013), who found that individuals with different education levels have diverse standards for forest recreation, and residents with a low education tend to attach more importance to forest value. Consequently, forest park managers should care more about residents with a lower level of education.

When it comes to income groups, the MCA showed that residents with higher incomes in the suburbs tended to assign the lowest scores to recreational value, but in rural areas they were more likely to have a neutral perspective. This illustrates that citizens with higher incomes experienced an attitude change from negative to neutral when they spent time in nature (Yu et al., 2018). However, residents of low-income classes tended to assign the highest scores to the recreational value of forest parks both in the suburbs and in rural areas. Consequently, it is more effective to adapt forest parks to citizens of low income.

5 Conclusions

This study investigated Shanghai forest park recreational value in the physical, psychological, and social dimensions through questionnaires, and examined the relationships between recreational values and residents' social variables.

The social dimension of forest recreational value was perceived as the least important, while the recreational value in the physiological dimension was appreciated the most.

In terms of the differences in forest park recreational values in suburban and rural areas, the social value in rural areas earned significantly higher scores than in the suburbs, and the psychological value in the suburbs was much higher than in rural areas. Regarding the social variables of residents in suburbs and rural areas, females tended to assign higher scores to the three dimensions of recreational values than males, and younger groups tended to give higher scores than older groups. Apart from that, citizens with a low education or low income also assigned higher scores to the three dimensions of recreational values compared to more educated or higher-income residents.

These results suggested that forest park managers and designers should pay attention to management goals which provide greater psychological value. In addition, it is necessary to make the forest parks in suburbs more natural or near-natural in order to attract more citizens who enjoy nature. For forest parks in rural areas, recreational activities adapted to family interactions should be promoted. In addition, it is suggested that policy-makers should pay more attention to women and young age groups to be sure their needs are met, and they should care more about residents of lower levels of income and education. This study reveals the recreational value characteristics of Shanghai forest parks in the three dimensions. It can provide a reference for the sustainable development of urban forest resources and contribute to reasonable planning and management.

6 Directions for future research

Two points worth noting may limit the generalizability of this study. First of all, forest parks in Shanghai are derived from artificial forests, all of which have existed for less than 100 years. The forest parks in this study originate from just 1993 to 2017, highlighting a major difference between the forest parks in Shanghai and most forest parks in other areas. Generally, the foundation for a forest park is the natural forest resources that have relatively stable forest structure and higher species diversity. Therefore, the application of the reults of this study elsewhere is restricted to some degree, since resident perceptions will differ when encountering natural versus artificial forests. Secondly, this study was conducted by issuing questionnaires. Due to the difficulty the elderly might have in understanding the questionnaire, the effectiveness of obtaining feedback from elderly residents was low. Therefore, the sample should also cover a more representative spread of residents (e.g., also in terms of other factors such as occupation, religion, and marriage status) in order to obtain higher confidence.

In spite of these limitations, this study illustrated the relationship between some key resident social variables and recreational value in Shanghai forest parks. Further inter-

views with stakeholders that can be categorized into interest groups (such as public administrators, associations, forestry companies, and tourism promotion bodies) are suggested. Stakeholders could assign their importance scores to the forest parks, and the stakeholder characteristics might then affect the degree of their participation in decision-making processes about the forest parks. Moreover, the forest structure characteristics and recreational facilities could have affected the residents' perceptions of forest parks. The increased public demand for getting close to nature indicates the importance of studying the relationship between the preferences that residents have for forest park recreation and forest structure characteristics.

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居民对森林公园游憩价值的感知研究：以上海为例

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　　摘　要：森林公园可为居民提供重要的游憩和旅游服务。了解居民对于森林公园游憩价值的感知，对于居民参与森林的规划和管理至关重要。本文通过对 658 名受访者进行问卷调查，探析上海森林公园三个维度的游憩价值：生理、心理和社会维度，并通过多重对应分析（MCA）考察不同维度游憩价值与居民社会变量之间的关系。研究结果表明：1）上海森林公园最重要的游憩价值是心理维度价值，最不重要的是社会维度价值；2）在郊区和农村的森林公园游憩价值的差异方面，农村的森林公园在社会维度价值的得分明显高于郊区森林公园，郊区森林公园在心理维度价值的得分高于农村森林公园；3）在森林公园游憩价值与居民社会变量之间的关系方面，总体上女性和青少年群体对于森林公园游憩价值的赋值高于男性和老年人群体，受教育程度较低或收入较低的居民对于森林公园游憩价值的赋值高于受教育程度较高或收入较高的居民。研究结果揭示了上海森林公园不同维度的游憩价值特征,可为城市森林资源的合理规划管理和可持续发展提供依据。

　　关键词：森林公园；多重对应分析；游憩价值；社会感知