Article

Demographic Groups' Differences in Restorative Perception of Urban Public Spaces in COVID-19

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Abstract: The health-promoting functions of one's spatial environment have been widely recognized. Facing the huge loss of mental resources caused by the COVID-19 pandemic, visiting and perception of urban public spaces with restorative potential should be encouraged. However perceived, restorativeness differs from individual features. Moreover, the COVID-19 pandemic has considerable effects on residents' leisure travel and psychological states. Therefore, the aim of our research is to identify the demographic variables influencing restorative perception of typical urban public spaces under the social background of the COVID-19 pandemic. The research consists of 841 residents' restorative evaluation of four kinds of urban public spaces according to the Chinese version of the Perceived Restorativeness Scale, including urban green spaces, exhibition spaces, commercial spaces and sports spaces. Then, 10 individual factors were recorded which represented their demographic features and the influence of COVID-19. Then, the relationship between individual features and perceived restoration of different urban public spaces was analyzed, respectively, by using One-way ANOVA and regression analysis. The results show that the urban green spaces were ranked as the most restorative, followed by commercial spaces, sports spaces and exhibition spaces. Further, the findings indicate that significant factors affect the restoration of four typical urban public spaces.

Keywords: urban public space; health-promoting environments; psychological restoration; demographic variable; COVID-19 pandemic

1. Introduction

The COVID-19 outbreak at the beginning of 2020 has made dramatical effects on public health both in mind and body all over the world. In China, the social policies and regulations for dealing with the outbreak limited people's abilities to partake in typical, out-of-home social activities, which caused a sharp decline in entertainment activities, social contact and physical activities. Therefore, emotional problems are common among urban residents in China after suffering from the COVID-19 pandemic, such as indolence, anxiety, depression and self-reported stresses [1]. The restorative environment is regarded as having potential and power to renew physical, psychological and social capabilities consumed in the process of adaptation [2]. Regarding the huge need of restoration for residents, visiting a restorative environment to regain mental capacities and energy is of great importance, especially during this special time.

There has been extensive published research demonstrating the restorative attributes of some kinds of urban public spaces (UPSs), including urban green spaces, exhibition spaces, commercial spaces and sports spaces. First of all, the UPSs are identified as a typical restorative environment by creating natural experiences [3]. Residents who have close and frequent contacts with parks, gardens or other sources of natural environment report less stress and negative attitudes [4]. Although natural environments are the typical settings for possessing restorative potential, well-designed constructions are also capable of attracting involuntary attention and thus promoting restoration from directed attention

fatigue. Museums contribute to restorative experiences for some people. The earliest study about this was conducted by Kaplan et al. [5], which declared the restorative experience offered by art museums, especially for frequent visitors. Similar conclusions were also drawn in other museum environment, such as zoos, history museums or galleries [6–8]. Moreover, Rosenbaum et al. [9] illustrated that shopping centers could provide customers with restorative servicescapes by decorating them with green facilities. On the other hand, markets or other similar commercial spaces were proved to contain restorative potential by enhancing social supportive resources and encourage communication and gathering [10,11]. As we all know, physical activities bring significant emotional benefits by improved self-esteem, enhanced emotional regulation, adaptation to stress and better sleep quality [12], which is beneficial to physical and mental restoration. The lack of physical activity is a leading risk factor for depression during the pandemic [13]. Therefore, the sports spaces were concluded as restorative in our studies.

It has been suggested that restorative benefits caused by the environment differ because of the diversities of demographic characteristics (DCs) [14]. Hartig et al. [15] considered gender as a determinant of restorative outcomes by investigating the differences on the perceived restoration of 26 couples. Regan and Horn [16] explored the association between ages and environmental preference by taking people aged from 6 to 76 years-old as a sample. Additionally, the person–environment fit theory points that people tend to prefer an environment which is correlated with their needs or capacities [17], which emphasizes the compatibility between individual attributes and the environment. For example, monasteries are thought of as a restorative environment only for pilgrims who could understand its cultural connotations [18]. Then, Korpela et al. [19] regarded natural hobbies and natural experience, health self-assessment, life satisfaction and social support as demographic factors because of their influence on visiting desire and restorative need. Therefore, the chosen determinants related to personal features are mainly guided by research about the personality traits referred to above when taking into the distinct restorative perception of spaces, including gender, age, education, natural hobbies and natural experiences, health self-assessment, life satisfaction and social support.

The analysis of the research literature above shows the great potential of UPSs and residents' strong needs to renew their mental resources. However, the pandemic in China has been basically brought under control and most of UPSs can be visited normally at present. Risks of infection still exist and affect people's behavior and psychology, especially the frequency and willingness to visit public spaces. Some studies related to the influencing factors of leisure travel give the present research inspirations. Perceived risk was defined as the unpredictable consequences of one' actions [20]. In the process of visiting the destinations, it has a huge influence on people's decisions and satisfaction [21], which, according to our studies, mainly results from the possibility of inflection of COVID-19. Therefore, we selected three items that represented the perceived risk caused by the COVID-19 pandemic as additional demographic variables, including the perceived severity of COVID-19, perceived risk of visiting and infection history of COVID-19.

To sum up, the present study was inspired by the changes of residents visiting and perceiving urban public spaces under the influence of the COVID-19 pandemic. In consideration of their health and attitude problems caused by social isolation and disease stress, it is important to find out the restorative outcomes of UPSs during special times such as these more deeply. Though some published studies have documented the relationship between restorative perception and demographic characteristics well [22], there is little discussion about the impact of the pandemic, which has significant impacts on behavior patterns and personal factors.

Although the differences in perceptions of restorative environments among groups have been widely discussed, the effects of the pandemics have not been explored. Moreover, published studies mainly focused on urban green spaces and paid less attention to other kinds of urban public spaces, especially indoor spaces. Considering the proven effects of DCs on perceived restoration (PR), we hypothesized that people with different DCs will

make different restorative evaluations of UPSs, and some DCs will consider some types of UPSs to have more important effects on PR. In order to verify the hypotheses, the aim of the study is to (1) identify the key DCs influencing restorative perception of typical UPSs under the social background of the COVID-19 pandemic and (2) evaluate the impact degree of DCs on restorative perception in four typical UPSs.

2. Methods

2.1. Study Area

Our study area was Xuzhou City (34° N and 117° E), belonging to Jiangsu Province in consideration of its representativeness of most cities in China. Then 4 kinds of city public spaces which had been evaluated as restorative in published studies were recognized as research objects, including (1) city green spaces, (2) exhibition spaces, (3) sports spaces and (4) commercial spaces. After that, 3 specific buildings or outdoor spaces with different sizes or appearances in each type were picked in order to show its characteristics more comprehensively. Additionally, all selected places have good operations and free visitations during the survey period. Located in main urban areas, there are no obvious economic or demographic differences among regions. To reduce the interference of social–cultural factors, we exclude those with special events such as festival celebrations, sales promotions and sports games. At last, 12 locations have been selected as final survey subjects. Their information is shown below in Table 1.

Table 1. Information of study areas.

Types of Spaces	Place 1	Place 2	Place 3
City green spaces	A1: Yunlong Park, 30.67 ha, including 8 ha of water surface, city center	A2: Quanshan Park, 113.33 ha, including 0.21 ha of water surface, south of city	A3: Huaihai Park, 39.85 ha, including 0.43 ha of water surface, east of city
Exhibition spaces	B1: Xuzhou museum, building area 12,000 m^2, west of city	B2: Xuzhou Zoo, floor area 73,333 m^2, city center	B3: Xuzhou City Wall Museum, building area 950 m^2, city center
Sports spaces	C1: Xuzhou city stadium, building area 66,700 m^2, for 6000 people, west of city	C2: Han gymnasium, building area 500 m^2, south of city	C3: Lide fitness center, building area 2000 m^2, south of city
Commercial spaces	D1: Hubu mountain pedestrian street, length 1200 m, center of city	D2: Wanda shopping mall, building area 53,000 m^2, south of city	D3: Kuangxi small market, building area 700 m^2, west of city

2.2. Perceived Restorativeness Assessment

The questionnaire consisted of three parts. The first part aimed to obtain demographic information including (1) gender, (2) age, (3) education level, (4) natural hobbies and natural experiences, (5) health self-assessment, (6) life satisfaction and (7) social support, which were inspired by published research. The second part was to investigate the effects of the COVID-19 pandemic on residents' perception and attitudes, consisting of (8) perceived severity of COVID-19, (9) perceived risk of visiting the space, and (10) own or familiar people' infection of COVID-19. The third part was the Chinese version of Perceived Restorativeness Scale (PRS) containing 22 items, established by Ye et al. [23], which had high reliability and validity (a = 0.936/ S-B = 0.903), to measure citizens' obtained perceived restorativeness after visiting the spaces. The pretest was conducted by 20 people without professional knowledge from different ages and educational groups, to ensure the clearness of all questions and acceptable reliability and validity. According to that, a few alterations were made.

The field survey was conducted during June of 2021, when the spread of COVID-19 had been largely brought under control and residents could visit urban public places more freely than during the outbreak period. In total, 80 questionnaires were distributed in

12 places, respectively, with the uniform distribution of genders and ages. People with professional knowledge, alcohol or drug addiction, mental or physical illnesses, emotional frustration, and life challenges were excluded. In order to avoid cognitive bias caused by unfamiliarity with the places, we chose frequent visitors. We notified each participant about the content and purpose of our experiment and obtained their permission before proceeding. The survey of each place happened between 9 am and 11 am in sunny weather. In the end, the 960 questionnaires were taken back. The missing or casual questions were excluded, and 841 valid ones were obtained.

2.3. Data Analysis

For data analysis, we used SPSS 22.0 software. Firstly, the data was processed by the method of One-way ANOVA to test if there is a significant difference in restorative evaluation of UPSs among different demographic groups. The demographic characteristics which have significant effects on restorative perception of 4 typical urban public spaces were identified, respectively. Then, to measure the degree of influence degree of demographic characteristics on perceptive restoration of urban public spaces, the stepwise multiple linear regression analysis was carried out. Before starting the regression analysis, a correlation analysis was performed to avoid problems with multicollinearity. These methods have been widely and frequently used in similar research to analyze the perceptive difference of people with different demographic characteristics [24]. For example, Wang and Zhao (2017) used these methods to check and assess demographic variables' effect on landscape preference [25]; Rogge et al. (2007) utilized them to analyze differences in perception of rural landscapes among different groups [26].

3. Results

3.1. Description of Samples

Firstly, the interclass reliability of demographic information and four parts of the restorativeness assessment were calculated, respectively. Cronbach's α of demographic information was 0.908, which showed that the survey data is considered to have internal consistency. Then, Table 2 shows the description of participants' demographic characteristics, which was similar to population features of Xuzhou in 2010. Additionally, a higher proportion of respondents are aged between 25 and 30, probably due to a higher frequency of outdoor excursions in younger people. In addition, by calculating the mean restorative scores of each type of urban public space, we ranked the urban green spaces (mean = 46.67) in the order of the most restorative, followed by commercial spaces (mean = 43.44) and sports spaces (mean = 39.90). Additionally, the exhibition spaces (mean = 39.17) supplied the least PR values in our results.

3.2. Rating Restorative Experiences of Eight Rooms

The intraclass correlations coefficient was calculated to test the interclass reliability. The results were Cronbach's α = 0.901, $p < 0.001$, which showed a high consistency. Then, the mean scores of each place were calculated to rank their restorative potential (Table 3). Huaihai Park (A3) had the highest scores followed by Xuzhou Zoo (B2) and Yunlong Park (A1), while the Xuzhou city (C1) stadium has the lowest scores. The city green spaces have the highest restoration, followed by commercial spaces, sports spaces and exhibition spaces.

Table 2. Description of characteristics of participants (*n* = 841).

Demographic	N	%	Demographic	N	%
Gender			Life satisfaction		
Male	417	49.6	Dis-satisfied	297	35.3
Female	424	50.4	So-so	247	29.4
Age			Satisfied	297	35.3
18–30	64	7.6	Social support		
31–40	370	44.0	Not much	111	13.2
41–50	92	10.9	Moderate	334	39.7
51–60	136	16.2	Much	396	47.1
Over 61	179	21.3	Perceived severity of COVID-19		
Education			Not serious	247	29.4
Higher education	284	33.8	A little serious	309	36.8
Without higher education	557	66.2	Very serious	285	33.8
Natural hobbies and Natural experiences			Perceived risk of visiting		
Few	395	47.0	Not risky	240	28.5
Moderate	358	42.6	A little risky	223	26.5
Many	88	10.4	Very risky	378	45.0
Health self-assessment			Infection of COVID-19		
Sick	198	23.5	None	756	89.9
Subhealthy	291	34.6	Familiar person's infection	64	7.6
Healthy	352	41.9	Own infection	21	2.5

Table 3. The restorative ranking of 12 study places.

Places	City Green Spaces			Exhibition Spaces			Sports Spaces			Commercial Spaces		
	A1	A2	A3	B1	B2	B3	C1	C2	C3	D1	D2	D3
Mean	4.83	4.52	4.98	3.21	4.85	3.36	3.67	4.55	4.32	4.45	4.63	4.51
Grand average	4.78			3.81			4.18			4.53		
Ranking	1			4			3			2		

3.3. Significant Factors of Perceived Restoration

Using One-way ANOVA, the influential factors were identified (Table 4). There were significant differences in the restorative perception of urban green spaces among people with different natural hobbies and natural experiences (F = 4.325, *p* = 0.039) and life satisfaction (F = 5.293, *p* = 0.022). Education (F = 9.248, *p* = 0.008), social support (F = 3.848, *p* = 0.005) and perceived risk of visiting (F = 3.988, *p* = 0.041) were considerable factors when regarding people's perception of exhibition spaces. People with different social support and perceived risk of visiting show markedly different evaluations of sports spaces. In commercial spaces, age, gender, perceived risk of visiting and infection of COVID-19 are important demographic factors. Then, the correlation analysis among identified factors showed that perceived risk of visiting was related to infection of COVID-19, educational level was related to life satisfaction and social support, and perceived severity of COVID-19 was related to perceived risk of visiting (Table 5). Apart from that, no statistically significant correlations existed among demographic factors.

At last, the detailed perceived differences were explored by calculating the mean and standard deviation of restorative ratings from different groups. Generally speaking, participants with higher levels of education, natural hobbies and natural experiences, life satisfaction and social support showed more restorative assessment. However, the perceived risk of visiting and perceived severity of COVID-19 had negative effects on restorative perception. Moreover, participants aged 18 to 30 showed the highest rating for commercial spaces, followed by 41–50 years old, 51–60 years old and >60 years old. The respondents at the age of 31–41 ranked lowest (Figure 1).

Table 4. One-way ANOVA among different groups' assessment of urban public spaces.

Space	Demographic Variable	Sum of Squares	DF	Meansquare	F	P
Urban green space (*n* = 213)	Natural hobbies and Natural experiences	697.583	2	348.792	4.325	0.039
	Life satisfaction	780.500	2	390.250	5.293	0.022
Exhibition space (*n* = 207)	Education	2088.008	1	2088.008	9.248	0.008
	Social support	1933.000	2	966.500	3.848	0.045
	Perceived risk of visiting	1978.755	2	989.377	3.988	0.041
Sports space (*n* = 226)	Social support	507.951	2	354.413	3.215	0.31
	Perceived severity of COVID-19	549.668	2	274.834	4.844	0.022
Commercial space (*n* = 195)	Age	3168.143	4	792.036	4.066	0.024
	Gender	835.204	1	835.204	5.162	0.034
	Perceived risk of visiting	506.417	2	253.208	4.345	0.048
	Infection of COVID-19	587.503	1	587.503	4.526	0.049

Table 5. Correlations among significant demographic factors.

	Gender	Age	Education	Natural Hobby	Life Satisfaction	Social Support	Perceived Severity of COVID-19	Perceived Risk of Visiting	Infection of COVID-19
Gender		0.051	0.758	0.264	0.337	0.215	0.328	0.595	0.175
Age			0.325	0.221	0.157	0.127	0.204	0.215	0.307
Education				0.187	0.289 *	0.324 *	0.126	0.489	0.279
Natural hobby					0.056	0.081	0.192	0.135	0.176
Life satisfaction						0.215	0.384	0.429	0.495
Social support							0.517	0.269	0.124
Perceived severity of COVID-19								0.159 *	0.178
Perceived risk of visiting									0.141 **

* Correlation is significant at the 0.05 level. ** Correlation is significant at the 0.01 level.
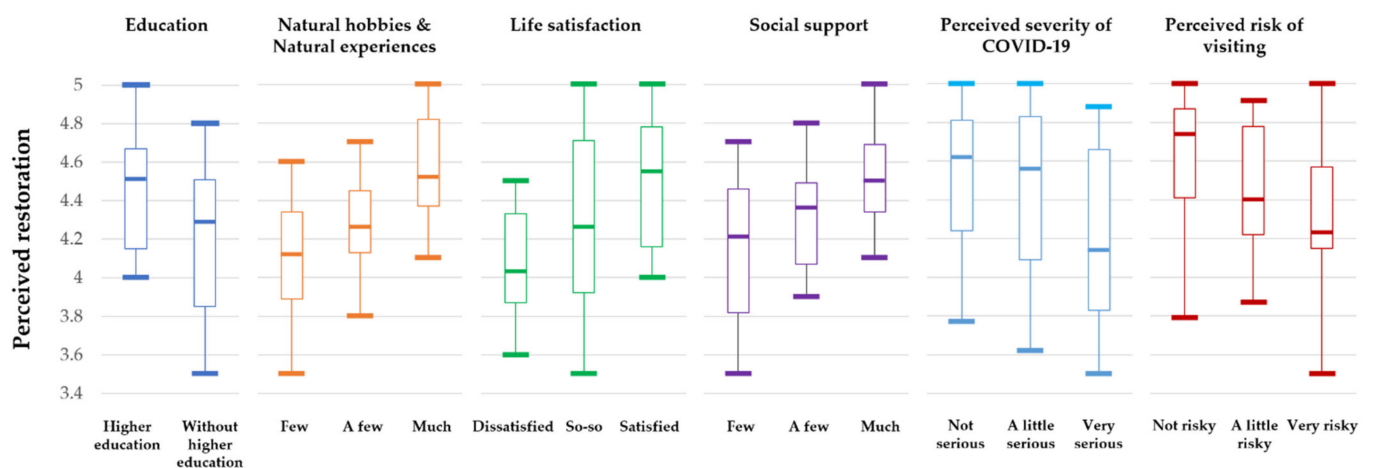
Figure 1. The description of overall PR of UPSs from different groups.

3.4. Degree of Effect of Demographic Variables

The significant correlations were further described by using the stepwise multiple linear regression analysis using the demographic factors as independents and the restorative scores of each participant as dependents. The results showed the degree of influence of the above key demographic factors on the restorative perception of four kinds of UPSs. There was no multicollinearity (VIF < 5) or correlation (D-W = 1.7~2.3) problems among independents. Moreover, all models can fit and describe the data well (Adjusted R^2 > 0.5).

For urban green spaces, about 75% of restorative scores could be explained by two predictors including life satisfaction and natural hobbies (R^2 = 0.751). They all had positive effects on restorative experience. Additionally, natural hobbies and natural experiences were more significant than life satisfaction (Table 6).

Table 6. The effect of demographic characteristics on restoration of urban green spaces.

Variables	Unstandardized Beta	Standardized Beta	t	Sig.	Collinearity Statistics	
					Tolerance	VIF
(Constant)	−57.026	-	−0.977	0.000	-	-
Life satisfaction	7.798	0.694	2.340	0.049	0.359	2.789
Natural hobbies and Natural experiences	9.963	0.907	2.683	0.036	0.274	3.650

Note: Adjusted R^2 = 0.751, D-W = 1.904, *n* = 213.

In exhibition spaces, three factors, including education level, social support and perceived severity of COVID-19, could clarify about 70% of the total variance in the restorative scores (R^2 = 0.699). Higher education levels and more social support will promote restorative experiences obtained by visiting exhibition spaces. Additionally, educational level had a stronger influence than social support, while the perceived severity of COVID-19 was considered to be a negative factor for mental restoration (Table 7).

Table 7. The effect of demographic characteristics on restoration of exhibition spaces.

Variables	Unstandardized Beta	Standardized Beta	t	Sig.	Collinearity Statistics	
					Tolerance	VIF
(Constant)	30.962	-	1.566	0.000	-	-
Education level	24.046	0.605	3.041	0.008	0.986	1.077
Social support	13.900	0.582	2.864	0.011	0.925	1.012
Perceived severity of COVID-19	−15.235	−0.588	−2.910	0.010	0.991	1.052

Note: Adjusted R^2 = 0.699, D-W = 1.840, *n* = 207.

In sports spaces, about 70% of the total variance in the restorative scores could be illustrated by the factors of social support and perceived severity of COVID-19 (R^2 = 0.727). They had a similar degree of influence. There was a positive correlation between social support and perceived restoration, while it was more difficult to perceive restoration in sports spaces for people who perceived a greater degree of severity in COVID-19 (Table 8).

Table 8. The effect of demographic characteristics on restoration of urban sports spaces.

Variables	Unstandardized Beta	Standardized Beta	t	Sig.	Collinearity Statistics	
					Tolerance	VIF
(Constant)		-	18.230	0.007	-	-
Social support	4.435	0.585	2.598	0.022	0.856	2.526
Perceived severity of COVID-19	−5.254	−0.577	−2.426	0.023	0.815	1.947

Note: Adjusted R^2 = 0.727, D-W = 1.882, *n* = 226.

In commercial spaces, four factors would explain 73% of the variance in the overall score for restorative assessment (R^2 = 0.731), including age, gender, perceived risk of visiting and infection of COVID-19. The factor of gender had the largest positive effects on restoration of commercial spaces, followed by age. Additionally, perceived risk of visiting and infection of COVID-19 had negative effects (Table 9).

Table 9. The effect of demographic characteristics on restoration of urban commercial spaces.

Variables	Unstandardized Beta	Standardized Beta	t	Sig.	Collinearity Statistics	
					Tolerance	VIF
(Constant)		-	3.219	0.013	-	-
Age	10.127	0.529	0.957	0.015	0.728	1.064
Gender	8.173	0.646	3.050	0.009	0.891	1.236
Perceived risk of visiting	−13.245	−0.156	−2.683	0.036	0.882	1.588
Infection of COVID-19	−24.941	−0.107	−2.127	0.049	0.890	1.397

Note: Adjusted R^2 = 0.731, D-W = 1.936, *n* = 195.

From the above results, we can see that different groups indeed show various evaluations of the same spaces, and each type of space had its unique key factors, which was consistent with results of the ANOVA. Additionally, perceived severity of COVID-19 and social support were regarded as playing important roles in both exhibition spaces and sports spaces.

4. Discussion

4.1. Verifying the Rankings of Four Typical UPSs

Our results showed that urban green spaces contained the most restorative potential, followed by commercial spaces, sports spaces and exhibition spaces, which could be supported by existing studies. As referred to in much precious research, the green experience is regarded as a kind of direct and effective resource arousing mental restoration [3,27,28]. Moreover, its outdoor environment supplies good ventilation and spacious places, which is beneficial to preventing the spread of the virus and avoiding close contact under the request of antipandemic precautions. Commercial spaces, such as shopping malls and business streets, are considered to be mechanisms supplying restorative services for customers [9]. Some special settings, such as comfortable benches, beautiful tables, green landscape or fountains in commercial spaces, would support customers' restoration by promoting social interaction and relaxation [29]. Sports could concentrate one's physical and mental resources quickly on the current activity, which may clear away random and disturbing thoughts and renew the directed attention energy. Plenty of studies have proven the healthy benefits of physical activities [30,31], such as positive mood and energetic state, which makes for self-regulation and recovery. However, as a type of drastic and intense stimulus, it is difficult to arouse the contemplative and peaceful state of mind which is a symbol of long-lasting restorative results [32]. Exhibition spaces supplied the least perceived restorativeness in our results. According to Packer and Bond [33] and Ouellette and Kaplan [18], museums on the theme of arts, history, zoos or monasteries were regarded as restorative environments for some people who could understand the artificial or historical connotation of exhibits or have related beliefs.

4.2. Identifying Differences in DCs' Contributions to PR for Different UPSs

The present results showed that there were considerable differences in significant demographic variables for four typical UPSs. Identifying the key demographic variables for each kind of UPS would be beneficial for choosing the most effective restorative environment for various groups and for making better considerations about individualized design.

Korpela et al. [19] have emphasized the associations between natural hobbies or natural experiences and mentioning green nature. People with rich natural experiences or an innate preference for nature have more desire to be around a green environment, and obtain more pleasure when there. It is in line with our results that natural hobbies and natural experiences are the most significant factors for urban green spaces. Then, the life satisfaction reflects the positive or negative trend they interpret regarding environmental elements [34]. Under normal conditions, the optimistic assessment of one' own life will result in high restorative perception, which is in line with our results, while the negative

correlations between the two items have also been proven because of the greater need for restoration for people with more life stress or terrible mood [35].

The existing emotional bond between commodities or shopping actions and customers enhance the restorative effect. Additionally, considering the Chinese social phenomenon of revenge spending during the postpandemic era, commercial spaces may bring much pleasure and entertainment, especially for females. Therefore, the female customers obtain more restorative outcomes than males from visiting shopping spaces in our results, which is consistent with the opinions of Korpela and Hartig [36] that restorative psychological processes proceed more in people's favorite places than in usual places. This view is also documented by Caspi et al. [17], who state that the environment correlated with individual's needs or abilities fits users better. Additionally, the commercial spaces process more restorative outcomes to participants at the age of 18 to 30, which may be due to their high frequency of their visits. In addition, most commercial spaces carry a high risk of spreading the virus because of their poor ventilation and dense flow. Therefore, the degree of individuals' perceived risk depends on their access frequency.

Social support has been regarded as an important factor in our results for sports spaces, which could be inferred from existing conclusions. For example, Staats and Hartig [37] suggested that companies would enhance restoration by offering a sense of safety and more pleasure, especially in urban environments. Sullivan et al. [38] proved the relationship between restoration and sense of community for individuals living in apartment buildings. Furthermore, most sporting events build on company or social connections [39]. Therefore, it could be argued that social support, including company, good interpersonal relationships and sense of community, would result in an increase in restorative perception. Additionally, perceived severity of COVID-19 was also a reliable predictor of one's restoration when visiting the sports spaces. During the outbreak period of the pandemic, the physical activities dramatically decreased, partly because of the shutdown of gyms and fitness centers, which caused an increasing need of physical exercise and worries about the inflection risk of visiting sports spaces at the same time [40]. Consequently, it is likely that the desire to visit sports spaces depends on individuals' perceived risk of COVID-19 during the postpandemic era of China.

The comprehensive and correct interpretation of the surrounding environment or emotional connections to the environment are the premise of compatibility and interaction, which is a requirement for the restorative process [41]. Additionally, frequent or repeat visitors are more likely to gain restoration than first-time visitors [5]. Therefore, participants with high educational levels more easily reported good evaluations of exhibition spaces regarding their restorative qualities because of their strong ability to understand and their investigation while visiting. As discussed above, the social support and low perceived severity of COVID-19 contribute to satisfying experiences and a sense of safety, which improve the frequency of exhibition spaces' visiting.

4.3. Detecting the Influence of Interaction among DCs on PR

Some demographic variables were related in our results, which was consistent with previous works [42]. This explains the reasons of conflicting study results on the degree of influence of DCs on perception and preference. The interactions among DCs largely depend on local socioeconomic conditions. For example, the education level would be more likely to be related to age and income in developing countries than developed countries because the elderly have less access to high-quality education due to limited resources. Thus, the studies conducted in different regions or with diverse participants would obtain divergent results. In our results, people who or whose families or friends have been infected with COVID-19 perceived a greater risk of visiting UPSs. It is not just because infected history or related experiences increase the fear and anxiety of the pandemic, but because this group will usually be identified as high-risk and thus be constrained from visiting UPSs to avoid the potential possibility of viral transmission. Additionally, educational level was related to life satisfaction and social support, which was also in line with current national conditions.

Higher educational levels contribute to larger income and more social respect, which could enhance life satisfaction and social support.

Detecting the interaction among DCs helps with understanding the differences in RP of different groups. In the present study, people aged 18 to 30 obtained the strongest restorative experiences from visiting UPSs. The reasons may link to the interaction between perceived risk of visiting and infection of COVID-19. This age group has better physical and mental conditions and are more adventurous, which cause lower rates of disease and perceived risk. Thus, these two DCs together played an role in the process of perceiving spatial environment, which should be further explored.

5. Conclusions

Our research finds that DCs have effects on perceived restoration of UPSs, which differ depending on the type of space. Meanwhile, the factors which could embody the effects of the COVID-19 pandemic on people's bodies, minds and behaviors are considered. Overall, the urban green space is ranked the highest in terms of restorative potential, followed by commercial spaces, sports spaces and exhibition spaces, and the pandemic has negative effects on obtaining a restorative experience by adding visiting risk. On this basis, the significant factors in four typical UPSs were identified and their degrees of influence were evaluated, which further emphasizes the importance and novelty of this study. For example, the natural hobbies and life satisfaction are reliable predictors for urban green space.

Based on related studies on the restorative environment, there is no doubt that some UPSs have positive functions on relieving pressure, arousing mental restoration and promoting health, which city planners, landscape architects and even decision makers should make full use of, especially regarding the consumption of body and mind caused by COVID-19. Studies have already been conducted on the effects of DCs on restorative perception of urban green spaces. Our results are relatively in line with them, even after focusing on other kinds of UPSs and Chinese samples, which strengthens the foundation for wider application. Moreover, we also assess the impacts of the COVID-19 pandemic, which promotes the application of the restorative design into dealing with physical and mental consumption caused by social isolation and pandemic disease aggression. Given the groups' differences in preference for choosing restorative places, personalized design should be carried out to meet the needs of different groups in the processes of building design and planning layout of UPSs. The results presented here offer more evidence for understanding the relationship between DCs and perceived restoration, and more guidance for constructing restorative UPSs efficiently. Meanwhile, it provides directions for city managers to plan and for urban residents to decide how to visit restorative urban public spaces nearby.

In consideration of diversity, 12 places respective of four kinds of UPSs were selected as research locations. However, disadvantages still exist when referring to generalization, because it is hard to contain all features of the UPSs with limited study areas. Although we selected participants randomly, some socioeconomic factors are still ignored. For instance, people with less leisure time, physical disabilities or low accessibility to UPSs have fewer opportunities to visit UPSs and are excluded in our study. The nonconsideration of the environmental features of UPSs also represents a possible bias. In addition, using the Chinese version of Perceived Restorativeness Scale as a measurement tool may lead to semantic guidance, which can cause a biased restorative assessment.

Thus, to obtain more accuracy and better applicable conclusions, studies with larger samples and more comprehensive measurements should be conducted. In addition, we should further analyze the impacts of the pandemic on individual travel behavior and identify more related demographic factors to carry out a more comprehensive study of the restorative environment in response to the pandemic. Additionally, differences in restorative needs of different groups before and after the pandemic should be explored to carry out more targeted space design.

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