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Investigating the influence of elements in pocket parks on the psychological restoration of young people: a study from Guiyang and Chongqing in Southwest China

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ABSTRACT

In an era marked by rapid pace and demanding work schedules, young individuals frequently experience mental exhaustion and emotional downturns, exacerbating mental health issues. Recognizing this, prior studies have underscored the significant role of pocket parks in fostering emotional rejuvenation. However, previous research has primarily suggested that green natural elements in pocket parks positively influence restorative effects, without thoroughly examining the restorative power of different natural elements. Furthermore, there has been a lack of systematic analysis to quantify the impact of both natural elements and activities in pocket parks on their restorative effects. This research adopts a quantitative approach to explore the interaction between psychological attributes and the restorative impacts of various natural elements within pocket parks. It also considers the influence of socio-demographic factors, ultimately proposing an evaluation model to assess these spaces' psychological restoration capabilities. Focusing on Guiyang and Chongqing as study locations, the research utilized 20 photographs to represent typical elements within pocket parks. Analysis of these images led to the identification of nine critical elements. Participants provided insights into how these factors relate to psychological characteristics and their subsequent restorative effects by responding to five carefully designed questions. The analysis revealed that amenities for relaxation and sports play a pivotal role in enhancing restorative outcomes and influencing psychological traits. Additionally, the effect of natural elements on restoration varied; while trees and water bodies positively contributed to restoration, shrubs and lawns were found to have a less significant effect. The study concludes by introducing an evaluation model that identifies the primary built environment factors influencing restoration. The results of this study are intended to guide the redesign of pocket parks and inform policy-making processes.

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Pocket parks; restorative effects; young people; mental health; park design

1. Introduction

As urban populations and human activities expand and concentrate globally, this often leads to a decrease in green spaces within cities (van den Bosch, Nieuwenhuijsen, and Van den Bosch, Matilda, Nieuwenhuijsen, Mark 2017). Consequently, studies on the relevance and impact of urban natural environments have increased (Madureira et al. 2018; Mensah et al. 2016; Venter et al. 2020). Regarding mental health, previous research has shown a concerning trend: while mental disorders have risen in recent years, particularly in densely built urban environments, increased exposure to natural settings significantly enhances psychological restoration (Chen and Jim 2008). This underscores the importance of integrating natural elements into urban planning to support mental health and mitigate this troubling trend.

According to data from the World Health Organization (WHO), mental health issues rank among the top ten causes of disability worldwide and contribute significantly to global mortality rates (Sayer 2001). Mental health problems have become a major concern, especially among specific demographic groups, such as young people (Zhang et al. 2019).

Due to the decreasing possibility to realize large green spaces with natural resources in urban areas, urban planners and city managers have considered more feasible, small-scale urban green spaces, which are usually called pocket parks, to provide both restorative environments and recreational areas. Based on previous research, it is clear that pocket parks play a vital role in alleviating psychological stress among urban populations if they provide a quiet, clean, and comfortable environment (Tervo and Al 2014). Highly stressed individuals experience a significant sense of relief from daily pressures and

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duties in the presence of nature, also within small parks (Peschardt and Stigsdotter 2013). Nordh, Hagerhall, and Holmqvist (2013) argue that larger parks are typically more restorative for individuals, yet it's interesting to note that in their study, some of the smallest parks received the highest ratings for restorative value.

Similarly, the facilities within pocket parks influence visitors' interest in using them. As an example in China if the park's seating does not offer sufficient shade, visitors' interest will significantly decrease (Lin and Feng 2023). Previous studies have examined the psychological restorative effects of pocket parks on the main age groups, including children, young people, middle-aged and elderly groups (Bagot 2004; Li, Niu, and Mou 2022; Wang et al. 2023). Additionally, scholars have demonstrated that natural elements have significantly more positive effects on the restorative benefits of pocket parks compared to other elements (Peng et al. 2023; Yin et al. 2023).

However, the current research has some shortcomings. Several studies reveal nuances and complexities in the relationship between natural elements and their restorative impact. For example, Galindo and Hidalgo (2005) found that natural elements in urban spaces do not necessarily increase the likelihood of restoration. Similarly, a study by Nordh, Hagerhall, and Holmqvist (2013) using eye-tracking to analyze attention in urban park photos highlighted varying correlations between natural elements and perceived restoration. Additionally, research by Tyrväinen et al. (2014), which involved walks in three distinct urban environments in Helsinki, reported the highest perceived restoration in woodland areas, although physiological stress indicators showed no significant variation across the other settings.

Building on this, the current study focuses on pocket parks in mountainous cities in China. By conducting a detailed quantitative comparison of internal elements, this research firstly explores the role of natural elements in users' perceived restorative effectiveness. The goal is to provide better guidance for the design of future pocket parks. Second, the paper hypothesizes that specific groups live specific psychological conditions and therefore react specifically to natural environments, while previous researches targeted general users groups. As an example Jiang, Chang, and Sullivan (2014) observed a gender-specific response to tree cover density in urban neighborhoods, impacting stress recovery among males but not females. These findings suggest that the role of nature in psychological restoration is complex and multifaceted, and differently perceived by different groups with different characteristics.

Third, current research primarily explores individuals' perceptions of restoration in pocket parks or examines specific factors contributing to restoration, overlooking the synergistic effects of various elements. In fact, the environmental attributes of pocket parks have been categorized into four dimensions: naturality, perceptibility, relaxation, and activity (Giles-Corti et al. 2005; Kaczynski et al. 2009). The naturality dimension, representing the natural features of pocket parks, is acknowledged for its profound influence on psychological restoration (Hitchings 2013). The perceptibility dimension relates to individuals' subjective experiences within the park, influenced by multisensory stimulation including tactile, olfactory, auditory, and visual cues, all of which collectively impact emotional states (Shahhosseini et al. 2021). The relaxation dimension focuses on the presence, comfort, and strategic placement of amenities conducive to rest, noting how inadequacies such as uncomfortable or unshaded seating can deter park usage (Pasha and Shepley 2013). The activity dimension addresses the availability and arrangement of facilities promoting physical engagement, with findings indicating a direct correlation between the provision of such amenities and increased physical activity among park-goers (Paquet et al. 2013). The lack of detailed quantification of how different factors synergistically influence the restorative impact of pocket parks hinders the ability to provide practical recommendations for their design and enhancement.

In summary, this research not only aims to explore the specific contributions of natural elements within pocket parks to the psychological well-being of college young people in China but also seeks to assess the comparative importance of these elements alongside other amenities and activities. By doing so, it is hoped to fill the gaps and provide a reference for how to reasonably arrange various elements in pocket parks to enhance psychological restorative effects. The constituent elements within pocket parks were analyzed using the picture-square measurement method, a method inspired by previous studies. The relationship between users' perceived restoration and the attributes of pocket parks was then analyzed with correlation analysis to provide a formula for guiding the construction of pocket parks.

2. Methods

2.1. Sampling

Currently, there is no general concept about the definition of pocket parks. In this study, pocket parks are defined as urban public green spaces with an area smaller than 1,000 m^2 by previous study (Gong, Zheng, and Ng 2016). Additionally, the selected pocket parks should have at least one side facing a road to clearly indicate their accessibility for free entry and exit. Various facilities and activities are showcased in the selected pocket parks to give respondents the imagination of the space where they can engage in

various activities. Due to the research objective of exploring the impact of natural facilities on the psychological restoration of young users, the selection of parks was based on a gradual increase in the presence of natural elements. The level of greenness varied across the selected pocket parks, ranging from predominantly grey with a few trees and a hard ground surface (hardscape), to predominantly green with the presence of lawns, shrubs, trees and water bodies.

In this study, pocket parks in the downtown of Guiyang and Chongqing were chosen as the research objects. Both Guiyang and Chongqing are the mountain city. This unique topography leads to a development pattern where two cities are highly concentrated. It is a typical example of high-density development cities in the southwestern region of China. Guiyang and Chongqing both belong to the typical subtropical-monsoon humid climate. A total of 200 photos were taken from pocket parks in these two cities. The photographs were captured from one side of the parks, aiming to include as many elements as possible to provide people with an understanding of the design elements present in these pocket parks. All photos were collected under similar weather conditions in summer with clear or slightly cloudy.

This study adopted the photo selection methods from previous similar studies to ensure the accuracy of this research (Peng et al. 2023). (1) Photos that included a significant number of visitors were excluded, as they could potentially influence respondents' judgments. (2) Photos that did not adequately reflect the main facilities and components of the park were excluded. (3) Photos that had similar compositions of facilities and activities were excluded. (4) Photos that included elements that could potentially bias respondents' judgments, such as litters or dilapidated facilities, were excluded. Finally, 20 photos were selected for further research. These 20 photos represent different constituent elements and types of activities within the pocket parks.

2.2. Measurement of physical environment

To reflect the impact of the physical environment comprehensively and accurately on the psychological restoration of young people, the evaluation factors need to be carefully considered and refined. Based on the previous studies (Bowler et al. 2010; Peschardt 2014) and on-site observation, 9 factors were included in this study (Table 1). The evaluation factors are mainly divided into two categories. One category is the environmental and facility elements within the pocket parks. The other category is the activity environment, which includes sports activities and possible leisure activities that can be conducted within the pocket parks.

To measure the physical environment of the pocket parks accurately, this study utilized a methodology previously employed by Shafer, Hamilton, and Schmidt (1969) and Nordh et al. (2009): the picture-square measurement technique. This approach has enabled the development of models that link environmental elements with individuals' psychological perceptions effectively. The pictures of pocket parks were processed in Photoshop. Each photo is covered by a grid of 20×40 squares. Different colored squares within this grid were used to represent different types of evaluation factors within the pocket parks (Figure 1). The number of squares occupied by each index was calculated, and the percentage of squares in the entire picture was computed.

2.3. Measurement of psychological restoration environment

Unlike the quantitative evaluation method used for assessing the physical environment of pocket parks,

Table.1. The factors used to evaluate the physical environment in pocket parks in this study.

Categories	Name	Description	Measurement methods
Natural environment	Tree area	Area of trees in the pocket park	The square method was used to calculate the number of squares occupied by trees in the park picture.
	Shrub area	Area of shrubs in the pocket park	The square method was used to calculate the number of squares occupied by shrubs in the park picture.
	Lawn area	Area of Lawn in the pocket park	The square method was used to calculate the number of squares occupied by lawn in the park picture.
	Water area	Area of water in the pocket park	The square method was used to calculate the number of squares occupied by water in the park picture.
	Hardscape area	Area of hard-pavement in the pocket park	The square method was used to calculate the number of squares occupied by hard-pavement in the park picture.
	Surrounding environment area	Area of surrounding buildings	The square method was used to calculate the number of squares occupied by buildings outside of the park picture.
socio-demographic environment	Sports facilities area	Area of sports facilities for young people to enjoy in the pocket park	The square method was used to calculate the number of squares occupied by sports facilities in the park picture.
	Activity pitch	Area of activity pitch for young people to enjoy in the pocket park	The square method was used to calculate the number of squares occupied by activity pitch in the park picture.
	Entertainment activities	Area of entertainment activities for young people to enjoy in the pocket park	The square method was used to calculate the number of squares occupied by entertainment activities in the park picture.

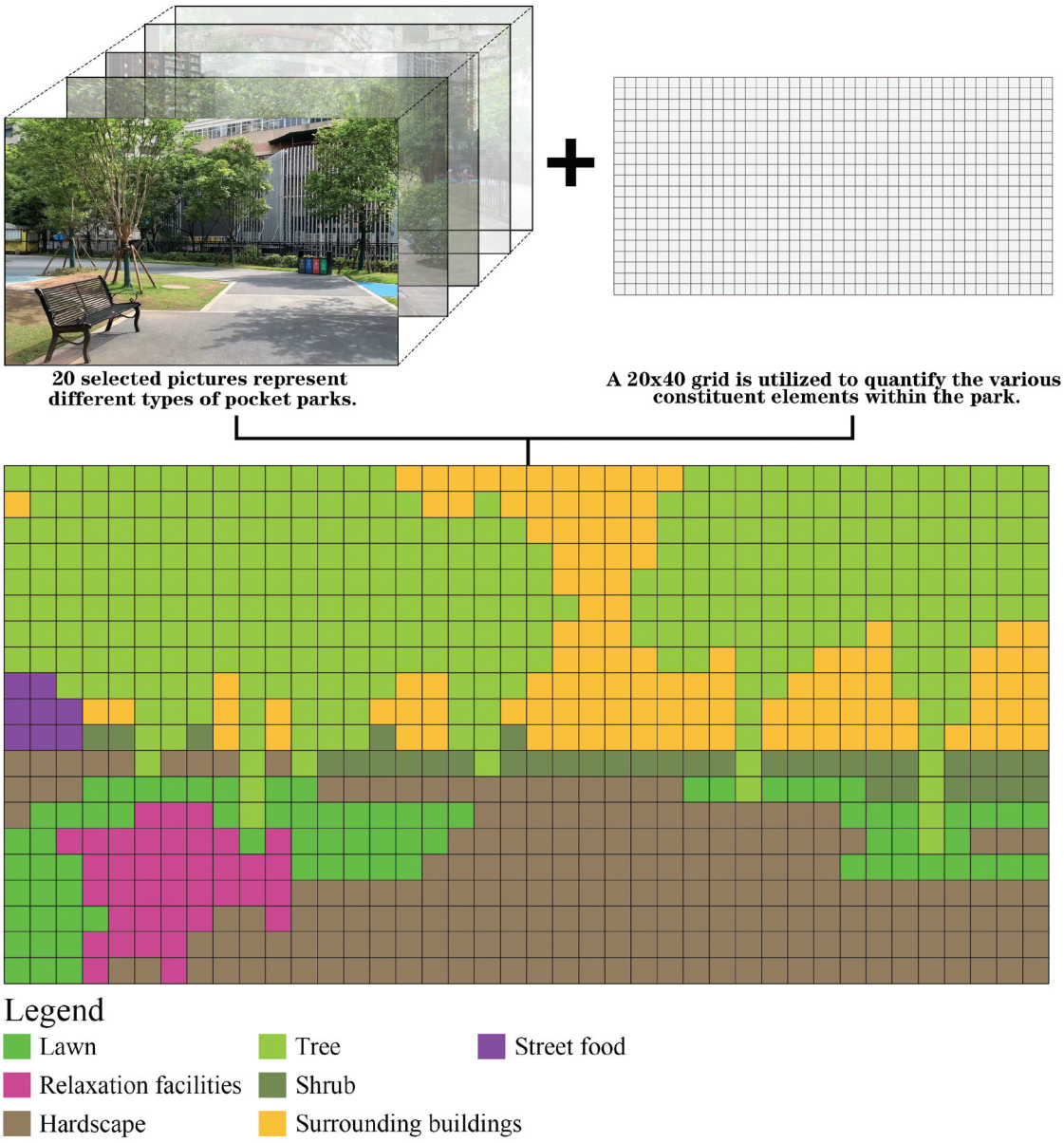

Figure 1. Process of quantifying pocket park features.

the evaluation of psychological restoration is based on the subjective perception of the participants. Based on the previous studies, the features of restoration environment were "being away", "fascination", "privacy", and "likelihood of restoration" (Zhu et al. 2023). In order to ensure that respondents have a clear and accurate understanding of each variable, in this study, each variable is explained using only one statement. The statement for being away was, "this location provides me with an opportunity to unwind from my hectic work and study schedule, offering an escape from the challenges of daily life where I can relax and recharge" and for fascination was "this location possesses a captivating charm that captures my attention". The statement of privacy was, "in this place, I can enjoy freedom from disturbances and interruptions" and for likelihood of restoration was "in this environment, I would have the opportunity to rest and rejuvenate, enhancing my ability to focus". For preference, the statement was described as "I like this place". Respondents rate the 20 photos on a scale of 0 to 10 (0=totally disagree; 10=completely agree) based on the above statements.

2.4. The process of pictures evaluation

The participants were the undergraduate students who are in the period of examinations. To ensure that the interviewed students understand the purpose and intention of this study, all participants are selected from the school of architecture and urban planning with relevant background knowledge. Prior to conducting the formal experiment, the respondents underwent a stress test (Cohen, Kamarck, and Mermelstein 1983), and the results indicated that all participants experienced a high level of stress. This experiment was conducted in the students'

classrooms. The experiment begins with a brief introduction to the purpose and procedure of the study to the participants. Afterwards, the selected photos for the experiment were quickly displayed to the respondents using the projector in the classroom, allowing them to establish a basic background impression of the study. Next is the formal testing phase. In this phase, the selected 20 photos are played sequentially, with each photo being displayed for 10 seconds for the respondents to rate. Finally, 46 complete response were collected from the participants.

2.5. Statistical analysis

The evaluation data obtained through the questionnaires have been processed with Z-values to acquire data suitable for statistical analysis. The standardized Z-value for each sample, reflecting both the restorative effect and environmental preference of the parks, were calculated using the means of all standardized values. This Z-value represents the overall restorative quality of the samples and the participants' mental judgments. Subsequently, these processed data have be analyzed in SPSS 23.0 to investigate the correlation between psychological environmental features and the restorative effect, as well as the correlation between the physical environment and the restorative effect. Finally, to identify key influencing factors and establish a corresponding restorative effect evaluation model, multiple-stepwise-linear-regression analysis will be applied in this study.

$$Z = \frac{(X - \mu)}{\sigma}$$

Where:

Z is the Z-value (standard score),
X is the value of the element,
μ is the mean of the population,
σ is the standard deviation of the population.

3. Results

3.1. Comparison of psychological characteristics and restorative effect

After comparing the standardized scores of psychological characteristics and restorative effect (Figure 2), it can be noted that the pattern of variations between the two remains consistent across the majority of surveyed park spaces. In other words, the park environments favor by the youth group tend to have a better restorative effect. To clearly delineate the relationship between psychological characteristics and restorative effect, regression analysis is employed in this study. The results of the regression analysis (Table 2) reveal

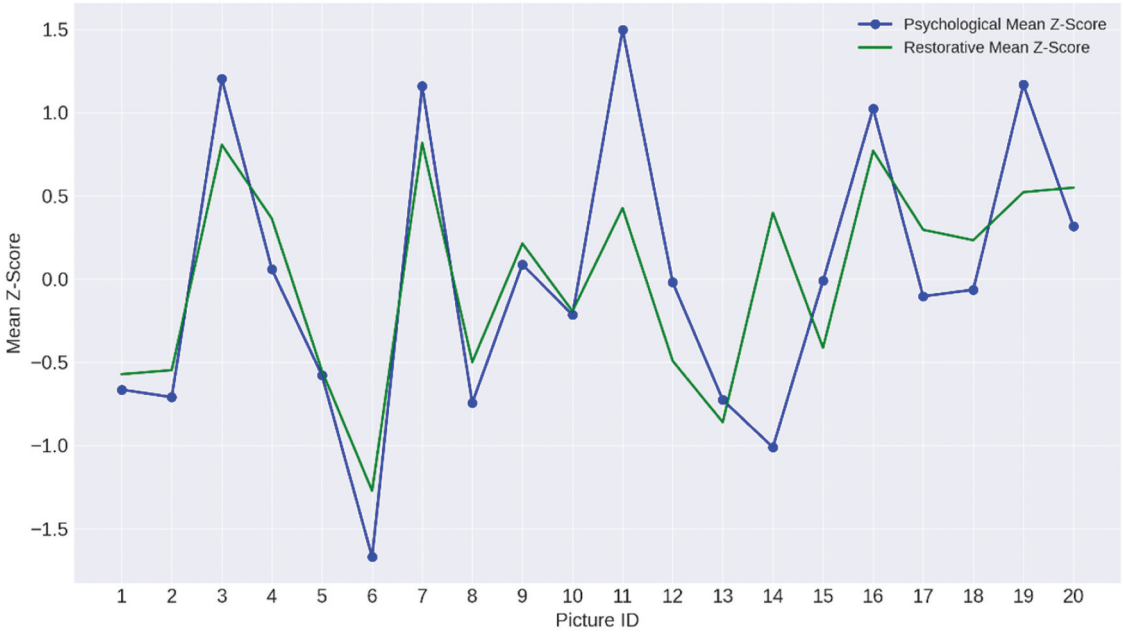

Figure 2. Comparison of and restorative effect scores.

Table 2. Regression coefficients of psychological characteristics and restorative effect.

		Non-Standardised Coefficient		Standardised Coefficient		
Model		B	Standard Deviation	Beta	t	Sig.
1	(Constant)	−1.462E-17	.084		.000	1.000
	Psychological Characteristics	.579	.101	.805	5.755	.000

[a]Dependent variable: Restorative effect.

that psychological characteristics can significantly positively influence the restorative effect of the environment. This finding is also in line with the previous studies (Li, Zhang, and Jia 2023; Liu et al. 2022).

3.2. Correlation analysis between the psychological characteristics and built-environments

When analyzing the three elements (being away, fascination, and privacy) within psychological characteristics, it is found that the values of these three elements are similar only in the context of picture 3 and 7, while their performances in other scenarios vary (Figure 3). Therefore, it is not feasible to simply use the performance of one element as the basis for evaluating psychological characteristics. In the next, this research explores the correlation between the three identified factors and the 9 types of built environments previously outlined, aiming to deepen understanding of how the elements of pocket parks influence psychological characteristics.

3.2.1. Factors of the physical environment affecting "being away"

Based on the result of the multiple-linear-regression (Table 3), "being away" is influenced by "relaxation facility", "sports facility", and "water" positively. Meanwhile, "sky", "lawn", and "street food" have a significant negative impact on the sense of "being away". Among these influencing factors, the most significantly positive factor is "relaxation facility", with a B value of 9.722. This means that for

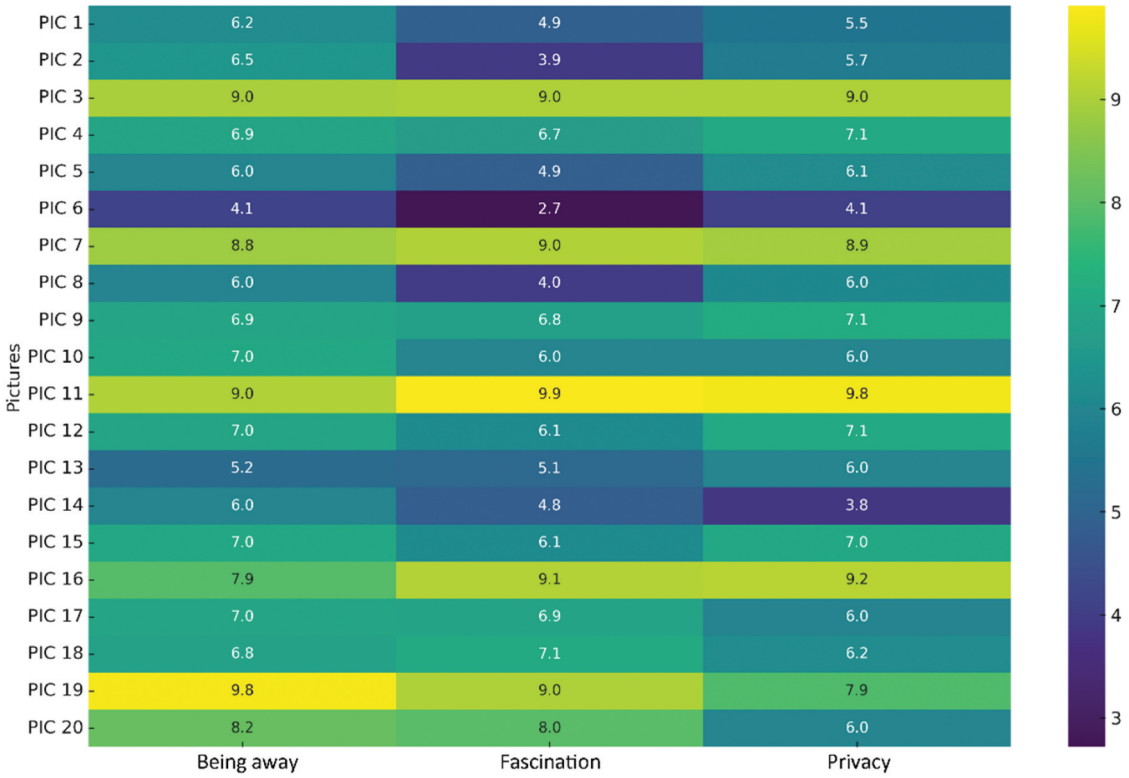

Figure 3. The results of the score of psychological characteristics.

Table 3. Correlations between "being away" and the built environments.

Model		Non-Standardised Coefficient		Standardised Coefficient		
		B	Standard Deviation	Beta	t	Sig.
1	(Constant)	6.668	.738		9.037	.000
	hardspace	−1.168	.808	−.090	−1.446	.149
	relaxation facility	9.722	.813	.615	11.956	.000
	shrub	1.083	.692	.072	1.565	.118
	tree	.424	.806	.034	.526	.599
	sky	−25.321	2.384	−.393	−10.620	.000
	lawn	−4.948	1.410	−.176	−3.510	.000
	surrounding environment area	−.209	.871	−.013	−.240	.811
	sports facility	5.985	.966	.282	6.195	.000
	water	9.689	2.602	.160	3.724	.000
	street food	−49.002	4.514	−.330	−10.856	.000

[a]Dependent variable: being away.

Table 4. Correlations between "fascination" and the built environments.

Model		Non-Standardised Coefficient		Standardised Coefficient		
		B	Standard Deviation	Beta	t	Sig.
1	(Constant)	−6.639E-05	.020		−.003	.997
	hardspace	.018	.055	.018	.323	.747
	relaxation facility	.721	.046	.721	15.720	.000
	shrub	.021	.041	.021	.506	.613
	tree	.263	.058	.263	4.540	.000
	sky	−.344	.033	−.344	−10.367	.000
	grass	−.034	.045	−.034	−.757	.449
	surrounding environment area	.150	.050	.150	2.983	.003
	sports facility	.361	.041	.361	8.870	.000
	water	.082	.038	.082	2.122	.034
	street food	−.296	.027	−.296	−10.907	.000

[a]Dependent variable: fascination.

every additional unit of "relaxation facility", the sense of "being away" increases by 9.722 units. This indicates that adding "relaxation facility" in pocket parks can significantly enhance the sense of "being away" for young users. Similarly, adding "water" and "sports facility" in pocket parks can also enhance the sense of "being away" for young users. However, according to the results of the regression analysis, adding facilities such as "sky", "lawn", and "street food" in pocket parks can reduce the sense of "being away" among young users. Among these, the effect of "street food" is the most significant. When an additional unit of "street food" is added, the sense of "being away" decreases by 49.002 units. This indicates that the presence of "street food" can significantly reduce the sense of "being away".

3.2.2. Factors of the physical environment affecting "fascination"

Based on the result of the multiple-linear-regression (Table 4), "fascination" is influenced by "relaxation facility", "tree", "sports facility", and "water" positively. Meanwhile, "sky", and "street food" have a significant negative impact on the sense of "fascination". Among the factors with positive effects, "relaxation facility" (B = 0.721), "sports facility" (B = 0.361), and "trees" (B = 0.263) can significantly influence the sensation of "fascination". Similar to the "being away", "sky" and "street food" have a clear negative effect on the perception of "fascination" among young park users. This means that the presence of "sky" and "street food" in pocket parks can significantly reduce the sensation of "fascination".

3.2.3. Factors of the physical environment affecting "privacy"

The outcome of the regression analysis reveals that, with the exceptions of "sky" and "street food", every other factor positively influences "privacy". "relaxation facility" has the strongest positive effect on privacy (B = 0.721), with a very high level of significance, indicating their effectiveness in enhancing the sense of "privacy". "Sports facility" also has a significant positive impact on "privacy" (B = 0.351), making them an important factor in enhancing the sense of "privacy". The same situation is also observed with "shrub", the "surrounding environment area", "lawn", "water", and "hardscape". They all provide a positive impact on the "privacy" sensation in pocket parks.

3.3. Correlation analysis between the restorative effects and built-environments

This section explores the connection between the physical aspects of pocket parks and their restorative impacts, utilizing Pearson correlation analysis in SPSS 23.0 to accomplish this objective. The findings reveal the hierarchy of influence among elements within pocket parks on restorative effects as follows (Figure 4): water > relaxation facility > surrounding environment area > sports facility > hardscape > shrub > lawn > sky > tree > street food. Notably, elements from "hardscape" onwards exhibit a negative correlation with restorative effects. A critical observation from comparing the correlation coefficients among various elements highlights issues of collinearity. For instance, a significant correlation of 0.481 between "hardscape" and "street food" and a higher correlation of 0.724 between "water" and "lawn" suggest that not all variables are entirely independent. This interdependence may influence the precision of the model parameters, indicating the complexity of analyzing restorative effects within urban green spaces.

Therefore, in order to explore the degree of correlation between various factors, multiple-linear-regression analysis is introduced into this study. Based on the application of multiple-linear-regression analysis, a model is ultimately established to evaluate the restorative effects of youth pocket park users.

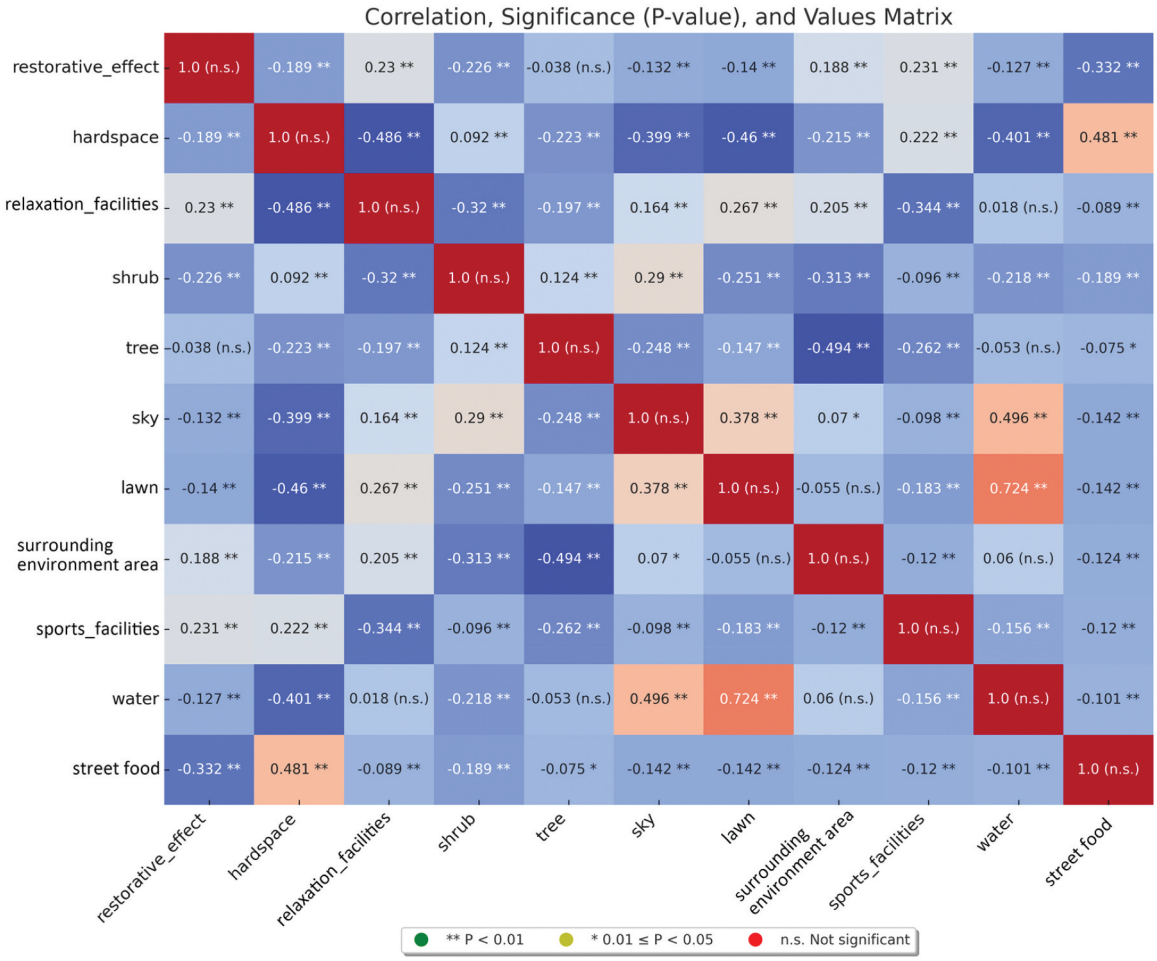

Figure 4. The results of Pearson correlation analysis.

3.4. Evaluation model of restorative effects of pocket parks for youth users

As mentioned earlier, a multiple-linear-stepwise regression is used to construct a model for evaluating the restorative effects. In this regression model, nine different types of built environments are set as independent variables. The restorative effect ratings given by young users according to the usage scenario served as the dependent variable. Through the multiple-linear-stepwise regression equation, unimportant factors are gradually eliminated, ultimately resulting in the evaluation model. The results (Tables 6–8) reveal that there are five final influencing factors, of which two are positive, namely "relaxation facility" and "sports facility". The three negative factors are "street food", "shrub", and "lawn".

From Table 6, it can be seen that through a multiple-linear-stepwise regression, the statistical explanatory capability of the five factors affecting the restorative effect of pocket parks is finally revealed. As shown in the table, the *R* value increases stepwise from 0.332 in Model 1 to 0.576 in Model 5, indicating that as variables increase, the model's explanatory power over the dependent variable is strengthening. Secondly, from the R square value, it can be seen that the model's explanatory power is enhanced as the number of variables increases (the R square value increases from 0.110 in Model 1 to 0.332 in Model 5). Besides, the Durbin-Watson value is 1.577. Generally, a DW value within the range of 1.5–2.5 indicates that there is no significant autocorrelation in the data, which suggests that there are no severe autocorrelation issues in the data presented in the table.

Table 7 shows that the significance value for model 5 is 0.000 < 0.005, indicating that all elements in model 5 are significantly related to the restorative effect. Therefore, a linear model can be established based on the five elements in model 5. From Table 8, a formula for evaluating the restorative effect is derived. The given constant term is the model's intercept, and for Model 5, its value is 0.001. This marks the starting point of the model formula, indicating the expected value of the dependent variable when all independent variable values are zero. The unstandardized coefficient (B) next to each variable indicates how much change is expected in the dependent variable for every unit change in that variable. For example, the coefficient for "street food" is −0.319, meaning that for every additional unit of "street food" quantity, the restorative effect is expected to decrease by 0.319 units, assuming other variables remain constant. By combining

Table 5. Correlations between "privacy" and the built environments.

Model		Non-Standardised Coefficient		Standardised Coefficient		
		B	Standard Deviation	Beta	t	Sig.
1	(Constant)	−.001	.021		−.047	.963
	hardscape	.113	.057	.113	2.005	.045
	relaxation facility	.732	.047	.732	15.640	.000
	shrub	.304	.042	.305	7.252	.000
	tree	.055	.059	.055	.935	.350
	sky	−.650	.034	−.650	−19.187	.000
	grass	.235	.046	.235	5.148	.000
	surrounding environment area	.292	.051	.292	5.702	.000
	sports facility	.351	.041	.351	8.470	.000
	water	.168	.039	.168	4.274	.000
	restaurant	−.212	.028	−.212	−7.650	.000

[a]Dependent variable: privacy.

Table 6. Model summary.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.332[a]	.110	.109	.794879175927753	.110	113.607	1	918	.000	
2	.443[b]	.197	.195	.755644277380003	.087	98.804	1	917	.000	
3	.527[c]	.278	.276	.716669640177127	.082	103.450	1	916	.000	
4	.551[d]	.304	.301	.704253661076979	.026	33.583	1	915	.000	
5	.576[e]	.332	.329	.690117695383779	.028	38.869	1	914	.000	1.577

[a]Predictors: (Constant), street food
[b]Predictors: (Constant), street food, shrub
[c]Predictors: (Constant), street food, shrub, lawn
[d]Predictors: (Constant), street food, shrub, lawn, relaxation facility
[e]Predictors: (Constant), street food, shrub, lawn, relaxation facility, sports facility.
[f]Dependent Variable: restorative effect.

Table 7. ANOVA.

Model		Sum of Squares	df	Mean Square	F	Sig.
5	Regression	216.499	5	43.300	90.916	.000[f]
	Residual	435.304	914	.476		
	Total	651.803	919			

[a]Dependent Variable: restorative effect.

Table 8. Coefficients of models.

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	−2.538E-16	.026		.000	1.000
	Street food	−.279	.026	−.332	−10.659	.000
2	(Constant)	.001	.025		.032	.974
	Street food	−.327	.025	−.389	−12.891	.000
	shrub	−.251	.025	−.300	−9.940	.000
3	(Constant)	.001	.024		.044	.965
	Street food	−.377	.025	−.448	−15.346	.000
	shrub	−.324	.025	−.386	−12.952	.000
	lawn	−.253	.025	−.301	−10.171	.000
4	(Constant)	.001	.023		.039	.969
	Street food	−.359	.024	−.427	−14.766	.000
	shrub	−.280	.026	−.334	−10.907	.000
	lawn	−.279	.025	−.331	−11.215	.000
	relaxation facility	.146	.025	.174	5.795	.000
5	(Constant)	.001	.023		.032	.974
	Street food	−.319	.025	−.379	−12.934	.000
	shrub	−.228	.027	−.272	−8.580	.000
	lawn	−.249	.025	−.295	−10.003	.000
	relax facility	.215	.027	.255	7.933	.000
	sports facility	.163	.026	.193	6.234	.000

[a]Dependent Variable: restorative effect.

the constant term and the coefficients of each variable according to the standard form of a linear model, where each variable is multiplied by its corresponding coefficient, and then all these terms are added together along with the constant term, the final model formula is constituted. The final evaluation formula is: Restorative Effect $= 0.001 + (-0.319 \times$ "street food") $+ (-0.228 \times$ "Shrub") $+ (-0.249 \times$ "Lawn") $+ (0.215 \times$ "Relaxation Facility") $+ (0.163 \times$ "Sports Facility").

Overall, this formula reveals how different factors affect the restorative effect of pocket parks. This equation shows that in a pocket park environment, each

unit increase in "street food" decreases the restorative effects by 0.319 units; each unit increase in "shrub" decreases the restorative effects by 0.228 units; each unit increase in "lawn" decreases the restorative effects by 0.249 units; each unit increase in "relaxation facilities" increases the restorative effects by 0.215 units; and each unit increase in "sports facilities" increases the restorative effects by 0.163 units. The model is designed to evaluate and compare the restorative effects in pocket park environments.

4. Discussion

4.1. The impact of pocket parks' built environments on psychological characteristics

Tables 3 to Table 5 provide the statistical results on how the elements in pocket parks affect psychological characteristics. By analyzing the unstandardized coefficients, standardized coefficients, t-values, and significance in the tables, these elements in pocket parks can be categorized into two major groups: positive and negative impact factors. "relaxation facility", "sports facility", and "water" generally have a positive effect on users' psychological feelings, which means that increasing these elements may help improve the mental state of pocket parks' users. These findings also have been supported by previous studies (Khaleghimoghaddam 2024; Li and Trivic 2024; Rapuano et al. 2022). This study further clarified the importance of "relaxation facility", as it holds the highest proportion among all factors affecting psychological restoration.

For instance, in all regression models of psychological characteristics, "relaxation facility" is the most significant influencing factor, especially in the "being away" model, where its B value is 9.722, which is far higher than other influencing factors. The result of this study also corroborates the "sports facility" has a positive influence on the psychological restoration (Wan et al. 2024). These findings provide a design direction for the upgrading and renovation of pocket parks. If there is a current lack of sports and relaxation facilities in pocket parks, then adding them in future upgrades and renovations can achieve the goal of enhancing the psychological restoration of young users. In addition, the results of this study suggest that the internal configuration of pocket parks warrants careful consideration by researchers and designers. Due to the limited area of pocket parks, excessively increasing various recreational facilities will inevitably affect the proportion of natural elements. Pocket parks have a dual function of providing recreational spaces for residents and regulating the microclimate. In future designs, it is necessary to balance the proportion of facilities and natural elements to maximize the functions and benefits of pocket parks.

Another finding of this study is the relationship between "street food" and young people's psychological restoration in pocket parks. Although young people have shown a strong affinity for street food, its presence in pocket parks appears to negatively affect visitors' psychological restoration. For example, in the "being away" model, there was a significant negative correlation between "street food" and the "being away" sentiment, with a B value of −49.002, the highest negative impact among all evaluated factors. This implies that incorporating "street food" into pocket parks may not promote, and could indeed impede, psychological restoration. However, field surveys reveal that there are a large number of street food vendors in the pocket parks of Guiyang and Chongqing. How to accommodate these vendors requires careful consideration by designers. Properly managing the location and distribution of these vendors in pocket parks can meet the actual needs of nearby residents while minimizing the impact of these vendors on psychological restoration.

The final and most crucial finding is the relationship between natural elements and the psychological restoration effects of young users in pocket parks. Although previous studies have demonstrated that exposure to natural environments can yield health benefits (Chen, Yu, and Lee 2018, Hartis et al 2014; Markevych et al. 2017). By further refining the focus of research, similar to this study, it becomes apparent that different types of natural elements have varying effects on the psychological restoration of young people. Some types of natural elements may even have a negative correlation with psychological restoration. The analysis results indicate that the presence of lawn has a negative impact on restoration effects. This finding is consistent with studies by Kenwick, Shammin, and Sullivan (2009) and Purcell et al. (1994). Scholars in these two studies indicated that environments with trees are preferential to ones with lawn. Furthermore, across the three models, the sky consistently showed a negative correlation with psychological efficacy. This suggests that the adolescent group perceives the visibility of the sky in pocket parks as having a negative impact on psychological restoration. Therefore, when designing, it might be beneficial to consider increasing the enclosure of pocket parks to enhance users' psychological restoration efficacy. This finding aligns with prior research indicating that urban areas surrounded by vegetation offer restorative benefits, as found by Grahn and Stigsdotter (2010) and Nordh and Østby (2013). Furthermore, Hauru et al. (2012) identified a positive link between these areas' restorative potential and their level of seclusion from urban surroundings.

The results of this study indicate that the effects of various natural elements on the psychological restoration of pocket park users are inconsistent. This research provides new insights for future pocket park designs. The selection and combination of different natural elements need careful analysis to maximize psychological restoration.

4.2. The explanation of restorative effect model for young users in pocket parks

The construction of the model leads to the development of an evaluation model for psychological restoration effects. Through quantitative analysis, five factors most related to psychological restoration efficacy are identified from nine influencing factors. These factors are divided into two categories: positively correlated and negatively correlated. The formula's analysis leads designers and scholars to a new understanding of pocket parks' functional positioning. This formula demonstrates that different natural resources have varying levels of psychological restoration efficacy for young users of pocket parks, and green natural resources do not exhibit an absolute influential position in psychological recovery. The factors affecting the psychological restoration efficacy for young users of pocket parks are various sports and leisure facilities. Therefore, pocket parks need to find a balance between preserving an ecological environment and offering users a diversity of activity facilities and spaces. In other words, the role of the green natural environment in pocket parks sometimes acts as a backdrop rather than a main feature. This finding is in line with previous study (Zhang et al. 2022). A strategically arranged mix of pocket parks, rather than exclusively green spaces beside streets, offers significant promise for enhancing urban landscapes and promoting a balanced park environment.

The introduction of the formula provides direction on how to integrate facilities and components within pocket parks effectively. Specifically, for the youth demographic, adding relaxation and sports facilities were identified as the positive factor affecting psychological restoration efficacy. Therefore, future pocket park designs should consider how to incorporate these two types of facilities to enhance their restorative potential. Due to the spatial limitations of pocket parks, the addition of facilities must be balanced by reductions elsewhere. The formula indicates that natural elements like "shrub" and "lawn" have a negative correlation with psychological restoration. Therefore, reducing the amount of shrubs and lawn in pocket parks can facilitate the addition of relaxation and sports facilities, aligning with the goal of enhancing their restorative potential. While pocket parks have a higher demand for socio-demographic factors than other types (Wang et al. 2021), this doesn't diminish the importance of their ecological attributes. Therefore, designers and urban planners need to find a balance between socio-demographic and ecological sustainability in practice, enabling pocket parks to maximize their objectives of serving the community and the environment.

4.3. Limitations and future works

This study focuses on college students but acknowledges that young people from different cultural backgrounds and occupations might have varying needs and interpretations regarding psychological restoration in pocket parks. Thus, the research might not fully represent the preferences of the broader youth demographic towards the restorative effects of pocket parks. Future studies should include young people from diverse professions, regions, and cultural backgrounds to comprehensively understand and elucidate the relationship between the youth demographic and the psychological restoration efficacy of pocket parks. In terms of research methodology, since this study was conducted in a limited number of parks, the picture-square measurement technique was feasible. However, if the research scope were expanded to the city level or a broader area, the disadvantages of this method in terms of time and labor costs would become apparent. Therefore, in future research, we plan to explore the introduction of artificial intelligence techniques such as semantic segmentation to process images, in order to investigate the feasibility of conducting similar studies on a larger scale. The evaluation formula proposed in this study provides a theoretical framework for future planning and construction of pocket parks to meet the psychological restorative needs of the youth. However, the factors influencing the restorative effect of pocket parks proposed in this study are based solely on the visual perceptions of the youth. The factors affecting the restorative effect of pocket parks are multidimensional. Future research needs to test the universality of this formula across a broader range of demographics and settings to effectively guide the planning and design of pocket parks.

5. Conclusions

Pocket parks provide urban users with highly accessible psychological restoration spaces. This study contributes to pocket park research by examining factors affecting restoration efficacy from both natural and socio-demographic environmental perspectives. Exploring these factors can enhance the utilization efficiency of pocket parks and benefit more users.

The main conclusions can be summarized as below: (1) Among the nine factors surveyed, "relaxation facility" and "sports facility" significantly and positively affect the psychological restoration efficacy for pocket parks' youth users. Therefore, future designs of pocket parks should prioritize these two types of facilities to better enhance the psychological restorative effects of pocket parks. (2) The impact of natural elements on the psychological recovery of young people needs to be discussed categorically. "Water" and "tree" have a positive effect on psychological recovery, while "shrub" and "lawn" have a negative effect on the psychological recovery of users. Therefore, it is necessary to reasonably match various natural resources to meet design

requirements and objectives. (3) When selecting other business types to complement stress relief in pocket parks, it's necessary to carefully demonstrate their effects. It's not advisable to make arbitrary additions based on experience. For example, street food, which is popular among young people, does not play a positive role in regulating psychological states. Hopefully, the results of this study can provide a theoretical basis for the future design, upgrading, and renovation of pocket parks, as well as the formulation of related policies.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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References

Bagot, K. L. 2004. "Perceived Restorative Components: A Scale for Children." *Children, Youth and Environments* 14 (1): 107–129. https://doi.org/10.1353/cye.2004.0028.

Bowler, D. E., L. M. Buyung-Ali, T. M. Knight, and A. S. Pullin. 2010. "A Systematic Review of Evidence for the Added Benefits to Health of Exposure to Natural Environments." *BMC Public Health* 10 (1): 456. https://doi.org/10.1186/1471-2458-10-456.

Chen, H.-T., C.-P. Yu, and H.-Y. Lee. 2018. "The Effects of Forest Bathing on Stress Recovery: Evidence from Middle-Aged Females of Taiwan." *Forests* 9 (7): 403. https://doi.org/10.3390/f9070403.

Chen, W. Y., and C. Y. Jim. 2008. *Assessment and Valuation of the Ecosystem Services Provided by Urban Forests*. New York, New York: Springer.

Cohen, S., T. Kamarck, and R. Mermelstein. 1983. "A Global Measure of Perceived Stress." *Journal of Health & Social Behavior* 24 (4): 385–396. https://doi.org/10.2307/2136404.

Galindo, M. P., and M. C. Hidalgo 2005. "Aesthetic Preferences and the Attribution of Meaning: Environmental Categorization Processes in the Evaluation of Urban Scenes." *International Journal of Psychology* 40 (1): 19–27.

Giles-Corti, B., M. H. Broomhall, M. Knuiman, C. Collins, K. Douglas, K. Ng, A. Lange, and R. J. Donovan. 2005. "Increasing Walking: How Important is Distance to, Attractiveness, and Size of Public Open Space?" *American Journal of Preventive Medicine* 28 (2): 169–176. https://doi.org/10.1016/j.amepre.2004.10.018.

Gong, F., Z. C. Zheng, and E. Ng. 2016. "Modeling Elderly Accessibility to Urban Green Space in High Density Cities: A Case Study of Hong Kong." *Procedia Environmental Sciences* 36:90–97. https://doi.org/10.1016/j.proenv.2016.09.018.

Grahn, P., and U. K. Stigsdotter. 2010. "The Relation Between Perceived Sensory Dimensions of Urban Green Space and Stress Restoration." *Landscape and Urban Planning* 94 (3e4): 264e275. https://doi.org/10.1016/j.landurbplan.2009.10.012.

Hauru, K., S. Lehvävirta, K. Korpela, and D. J. Kotze. 2012. "Closure of View to the Urban Matrix has Positive Effects on Perceived Restorativeness in Urban Forests in Helsinki, Finland." *Landscape and Urban Planning* 107 (4): 361–369. https://doi.org/10.1016/j.landurbplan.2012.07.002.

Hitchings, R. 2013. "Studying the Preoccupations That Prevent People from Going into Green Space." *Landscape and Urban Planning* 118:98–102. https://doi.org/10.1016/j.landurbplan.2012.09.006.

Jiang, B., C. Y. Chang, and W. C. Sullivan. 2014. "A Dose of Nature: Tree Cover, Stress Reduction, and Gender Differences." *Landscape and Urban Planning* 132:26–36. https://doi.org/10.1016/j.landurbplan.2014.08.005.

Kaczynski, A. T., L. R. Potwarka, B. J. A. Smale, and M. E. Havitz. 2009. "Association of Parkland Proximity with Neighborhood and Park-Based Physical Activity: Variations by Gender and Age." *Leisure Sciences* 31 (2): 174–191. https://doi.org/10.1080/01490400802686045.

Kenwick, R. A., M. R. Shammin, and W. C. Sullivan. 2009. "Preferences for Riparian Buffers." *Landscape and Urban Planning* 91 (2): 88–96. https://doi.org/10.1016/j.landurbplan.2008.12.005. landurbplan.2008.12.005.

Khaleghimoghaddam, N. 2024. "Zihinsel Rahatlamada Doğanın ve Fiziksel Çevrenin Rolü: Konya Kyoto Parkı." *Artium* 12 (1): 85–93. https://doi.org/10.51664/artium.1379482.

Li, J., and Z. Trivic. 2024. "Impact of "Blue-Green Diet" on Human Health and Wellbeing: A Systematic Review of Potential Determinants in Shaping the Effectiveness of Blue-Green Infrastructure (BGI) in Urban Settings." *Science of the Total Environment* 926:171397. https://doi.org/10.1016/j.scitotenv.2024.171397.

Li, X., X. Zhang, and T. Jia. 2023. "Humanization of Nature: Testing the Influences of Urban Park Characteristics and Psychological Factors on Collegers' Perceived Restoration." *Urban Forestry & Urban Greening* 79:127806. https://doi.org/10.1016/j.ufug.2022.127806.

Li, Y., S. Niu, and Y. Mou. 2022. "Gender Difference in the Chinese Middle-Aged and Elderly of Pocket Park Use: A Case Study of Zongbei Park." *Frontiers in Environmental Science*. 10:978935. https://doi.org/10.3389/fenvs.2022.978935.

Lin, M., and X. Feng. 2023. "Relationship Between Visitor Characteristics, Physical Activity Levels and Park Environment in Subtropical Areas' Urban Parks." *Urban Forestry & Urban Greening* 85:127958. https://doi.org/10.1016/j.ufug.2023.127958.

Liu, L., H. Qu, Y. Ma, K. Wang, and H. Qu. 2022. "Restorative Benefits of Urban Green Space: Physiological, Psychological Restoration and Eye Movement Analysis." *The Journal of Environmental Management* 301:113930. https://doi.org/10.1016/j.jenvman.2021.113930.

Madureira, H., F. Nunes, J. V. Oliveira, and T. Madureira. 2018. "Preferences for Urban Green Space Characteristics:

A Comparative Study in Three Portuguese Cities." *Environments* 5 (2): 23. https://doi.org/10.3390/environments5020023.

Markevych, I., J. Schoierer, T. Hartig, A. Chudnovsky, P. Hystad, A. M. Dzhambov, S. de Vries, et al. 2017. "Exploring Pathways Linking Greenspace to Health: Theoretical and Methodological Guidance." *Environmental Research* 158:301–317. https://doi.org/10.1016/j.envres.2017.06.028.

Mensah, C. A., L. Andres, U. Perera, and A. Roji. 2016. "Enhancing Quality of Life Through the Lens of Green Spaces: A Systematic Review Approach." *International Journal of Wellbeing* 6 (1): 142–163. doi: https://doi.org/10.5502/ijw.v6i1.445.

Nordh, H., C. M. Hagerhall, and K. Holmqvist. 2013. "Tracking Restorative Components: Patterns in Eye Movements as R Consequence of a Restorative Rating Task." *Landscape Research* 38 (1): 101–116. https://doi.org/10.1080/01426397.2012.691468.

Nordh, H., T. Hartig, C. M. Hagerhall, and G. Fry. 2009. "Components of Small Urban Parks That Predict the Possibility for Restoration." *Urban Forestry & Urban Greening* 8 (4): 225–235. https://doi.org/10.1016/j.ufug.2009.06.003.

Nordh, H., and K. Østby. 2013. "Pocket Parks for People – A Study of Park Design and Use." *Urban Forestry & Urban Greening* 12 (1): 12–17. https://doi.org/10.1016/j.ufug.2012.11.003.

Paquet, C., T. P. Orschulok, N. T. Coffee, N. J. Howard, G. Hugo, A. W. Taylor, R. J. Adams, and M. Daniel. 2013. "Are Accessibility and Characteristics of Public Open Spaces Associated with a Better Cardiometabolic Health?" *Landscape and Urban Planning* 118:70–78. https://doi.org/10.1016/j.landurbplan.2012.11.011.

Pasha, S., and M. M. Shepley. 2013. "Research Note: Physical Activity in Pediatric Healing Gardens." *Landscape and Urban Planning* 118:53–58. https://doi.org/10.1016/j.landurbplan.2013.05.005.

Peng, H., X. Li, T. Yang, and S. Tan. 2023. "Research on the Relationship Between the Environmental Characteristics of Pocket Parks and Young people's Perception of the Restorative Effects—A Case Study Based on Chongqing City, China." *Sustainability* 15 (5): 3943. https://doi.org/10.3390/su15053943.

Peschardt, K. K. 2014. *Health Promoting Pocket Parks in a Landscape Architectural Perspective*, 24–25. Rolighedsvej, Frederiksberg: Department of Geosciences and Natural Resource Management, University of Copenhagen.

Peschardt, K., and U. Stigsdotter. 2013. "Associations Between Park Characteristics and Perceived Restorativeness of Small Public Urban Green Spaces." *Landscape and Urban Planning* 112:26–39. https://doi.org/10.1016/j.landurbplan.2012.12.013.

Purcell, A. T., R. J. Lamb, E. Mainardi Peron, and S. Falchero. 1994. "Preference or Preferences for Landscape?" *Journal of Environmental Psychology* 14 (3): 195–209. https://doi.org/10.1016/S0272-4944(94)80056-1.

Rapuano, M., F. Ruotolo, G. Ruggiero, M. Masullo, L. Maffei, A. Galderisi, and T. Iachini. 2022. "Spaces for Relaxing, Spaces for Recharging: How Parks Affect people's Emotions." *Journal of Environmental Psychology* 81:101809. https://doi.org/10.1016/j.jenvp.2022.101809.

Sayers, J. 2001. "The World Health Report 2001—Mental Health: New Understanding, New Hope." *B World Health Organ* 79: 1085.

Shafer, E. L., Jr., J. F. Hamilton Jr., and E. A. Schmidt. 1969. "Natural Landscape Preferences: A Predictive Model." *Journal of Leisure Research* 1 (1): 1–19. https://doi.org/10.1080/00222216.1969.11969706.

Shahhosseini, H., M. Kamal, S. Maulan, and P. M. Samimi. 2021. "A Comprehensive Study of Preferences Toward Urban Pocket Parks." *Research Square* Reprint. https://doi.org/10.21203/rs.3.rs-213286/v1.

Tervo, S., and E. T. Al. 2014. "Preferences of Critical Listening Environments Among Sound Engineers." *Journal of the Audio Engineering Society* 62 (5): 300–314. https://doi.org/10.17743/jaes.2014.0022.

Tyrväinen, L., A. Ojala, K. Korpela, T. Lanki, Y. Tsunetsugu, and T. Kagawa. 2014. "The Influence of Urban Green Environments on Stress Relief Measures: A Field Experiment." *Journal of Environmental Psychology* 38:1–9. https://doi.org/10.1016/j.jenvp.2013.12.005.

van den Bosch, M., M. Nieuwenhuijsen, and Van den Bosch, Matilda, Nieuwenhuijsen, Mark. 2017. "No Time to Lose – Green the Cities Now." *Environment International* 99:343–350. https://doi.org/10.1016/j.envint.2016.11.025.

Venter, Z. S., D. N. Barton, V. Gundersen, H. Figari, and M. Nowell. 2020. "Urban Nature in a Time of Crisis: Recreational Use of Green Space Increases During the COVID-19 Outbreak in Oslo, Norway." *Environmental Research Letters* 15 (10): 104075. https://doi.org/10.1088/1748-9326/abb396.

Wan, J., H. Wu, R. Collins, K. Deng, W. Zhu, H. Xiao, and X. Tang. 2024. "Integrative Analysis of Health Restoration in Urban Blue-Green Spaces: A Multiscale Approach to Community Park." *Journal of Cleaner Production* 435:140178. https://doi.org/10.1016/j.jclepro.2023.140178.

Wang, P., B. Zhou, L. Han, and R. Mei. 2021. "The Motivation and Factors Influencing Visits to Small Urban Parks in Shanghai, China." *Urban Forestry & Urban Greening* 60:127086. https://doi.org/10.1016/j.ufug.2021.127086.

Wang, X., G. Li, J. Pan, J. Shen, and C. Han. 2023. "The Difference in the Elderly's Visual Impact Assessment of Pocket Park Landscape." *Scientific Reports* 13 (1): 16895. https://doi.org/10.1038/s41598-023-43522-y.

Yin, Y., Y. Shao, Y. Wang, and L. Wu 2023. "Developing a Pocket Park Prescription Program for Human Restoration: An Approach That Encourages Both People and the Environment." *International Journal of Environmental Research & Public Health* 20 (17): 6642.

Zhang, R., S. Peng, F. Sun, L. Deng, and Y. Che. 2022. "Assessing the Social Equity of Urban Parks: An Improved Index Integrating Multiple Quality Dimensions and Service Accessibility." *Cities* 129:103839. https://doi.org/10.1016/j.cities.2022.103839.

Zhang, S., X. Zhao, Z. Zeng, and X. Qiu. 2019. "The Influence of Audio-Visual Interactions on Psychological Responses of Young People in Urban Green Areas: A Case Study in Two Parks in China." *International Journal of Environmental Research & Public Health* 16 (10): 16, 1845.https://doi.org/10.3390/ijerph16101845.

Zhu, X., Y. Zhang, Y. Y. Luo, and W. Zhao. 2023. "Natural or Artificial? Exploring Perceived Restoration Potential of Community Parks in Winter City." *Urban Forestry & Urban Greening* 79:127808. https://doi.org/10.1016/j.ufug.2022.127808.