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Temporal and Spatial Characteristics and Influencing Factors of Public Space Vitality in Historical Blocks

—Taking Songcheng First Road in Zhaoqing as an Example

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Introduction and Purpose

1.Introduction

In recent years, the public space vitality in many historical blocks has declined sharply or the distribution of internal space vitality has been seriously uneven. Therefore, it is of great value to explore the factors affecting its vitality. European and American countries have studied block vitality earlier, and the research entry points are abundant, including **visual aesthetics, crowd spatial communication behavior needs and characteristics, individual perception and the sense of belonging in public space**. The research on block vitality in China started relatively late, mainly focusing on three aspects: **evaluation and measurement on block vitality, impact factor analysis and vitality promotion strategy**. There are abundant research perspectives on historical districts, while relatively little consideration is given to people's psychological needs and feelings in the selection of measurement indicators.

2.Purpose

This study aims to construct a perfect evaluation index system for the public space vitality in historical blocks and explore the influence of different factors on the space vitality. this study added the corresponding indicators that could reflect the subjective feelings of the population from the perspective of individual psychology. In data acquisition, observation, questionnaire survey and network open source data were combined to form more accurate research conclusions.

Research Method

1. Exploratory factor analysis

Referring to the classification of block evaluation factors by Chen et al, quantitative analysis of block vitality was carried out from three aspects: material elements, spatial scale and aesthetic attributes. In the selection of indicators, the research results of block vitality evaluation indicators were taken as the basis. Cultural facilities, cultural activities, activity experience, architectural features, visual effects, etc., were incorporated into the evaluation system based on field research and comprehensive consideration of people's psychological perception and block characteristics, as follows:

Table 1. Classification of block evaluation factor

Serial numbers	Evaluation level	Main purpose	Evaluation factors
1	Material element level	Measure people's flow, experience and material needs on the street	A1 people's flow
2			A2 cultural facilities
3			A3 public service facilities
4			A4 functionality
5			A5 cultural activities
6	Spatial scale level	Reflect the external environment of the individual and the appropriate scale in the block	B1 block location
7			B2 block safety
8			B3 spatial structure
9			B4 overall layout
10			B5 block density
11	Aesthetic attribute level	Reflect the environmental conditions and fun enjoyed by individuals in the block	B6 traffic conditions
12			C1 greening coverage
13			C2 block environment
14			C3 block sanitation
15			C4 architectural features
16			C5 visual effects
17			C6 activity experience

2. AHP

AHP was used to analyze 17 indicators such as people's flow, cultural facilities, etc. By constructing 17 judgment matrices, the average value in each analysis item was calculated, and the judgment matrix was obtained by dividing its average value. By analyzing the weight value and eigenvector value in each factor, the larger average value means that the factor is better and the weight is higher, which has a strong impact on the block vitality.

Results and Analysis

1. Temporal and spatial characteristics of historical block vitality

(1) Peak hours are concentrated in the afternoon and evening, forming multiple vitality centers in space;

Table 2. Statistical table of people's flow on weekdays and holidays in historical blocks

Time interval	People's flow (weekdays)	Thermodynamic diagram (weekdays)	People's flow (holidays)	Thermodynamic diagram (holidays)
5:30-7:30 am	31		15	
7:30-11:30 am	145		582	
11:30-13:30 noon	259		120	
13:30-17:30 pm	88		1158	
17:30-19:30 pm	374		336	
19:30-24:00 pm	652		837	

(2) The block space has a single function and the crowd activity is short;

Based on the interview records, the short stay time is mainly due to the fact that most tourists think this is only a place for daily walking and leisure. The content of leisure facilities in the block is single, lacking characteristic activities and tourism products. At present, the only few arcade commercial contents are also relatively single and lack of attraction, and thus they are not regarded as weighty tourist attractions.

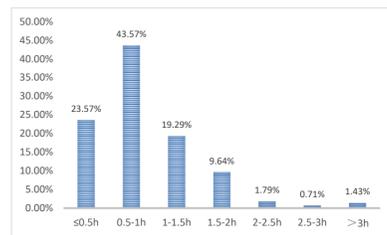


Chart 1. Population stay time in historical blocks.

(3) Places with cultural characteristics and green space are favored, with diversified forms of crowd activities;

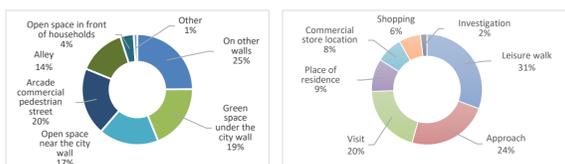


Chart 2. Distribution area of people's activities. Chart 3. Form of people's activities.

Time interval	Spatial distribution	Main activity types
5:30-7:30 am	Green space under sidewalk and city wall	Cleaning, walking and exercise
7:30-11:30 am	City wall, green space under the city wall, arcade commercial pedestrian block and historical block	Commuting, sightseeing, shopping and investigation
11:30-13:30 noon	Sidewalk	Commuting
13:30-17:30 pm	Green space on and under the city wall, arcade commercial pedestrian block and historical block	Leisure walking, sightseeing, shopping and investigation
17:30-19:30 pm	Green space under the city wall, open space near the city wall and sidewalk	Commuting and leisure walking
19:30-24:00 pm	Green space under the city wall, open space near the city wall, historical block and city wall	Leisure walking, physical exercise and visiting

(4) The activity group is mainly young people, and the space needs of different age groups are different

According to the questionnaire survey, the visiting youth (aged 21-30) accounted for 52.14%, accounting for more than half of the activity groups in the block.

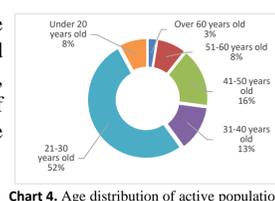


Chart 4. Age distribution of active population.

Results and Analysis

2. Historical block vitality evaluation status

(1) Material elements

The public service facilities and functional factors are lower than the average score.

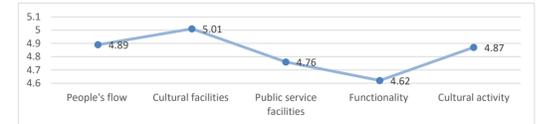


Chart 5. Factor evaluation score at material elements

(2) Spatial scale

The result reflects that the external environment perceived by the crowd in the ancient city wall historical block of Songcheng first road is more appropriate, while the internal scale of the block still needs to be improved.

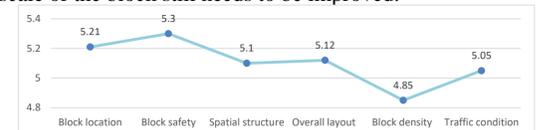


Chart 6. Factor evaluation score at spatial scale.

(3) Aesthetic attributes

The result reflects that the good environmental conditions and high degree of fun enjoyed by individuals in the block.

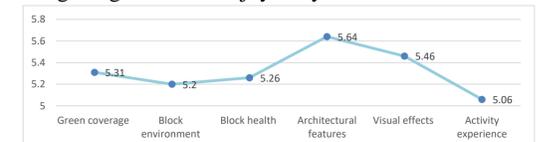


Chart 7. Factor evaluation score at aesthetic attribute.

3. Influencing factors of historical block vitality

Three factors were extracted by exploratory factor analysis. The cumulative variance explanation rate of the three factors after rotation was 68.881%. The proportion of factors in the three levels is relatively average and has strong correlation.

Table 3. Factor load coefficient after rotation

Name	Factor load coefficient			Common degree (common factor variance)
	Factor 1	Factor 2	Factor 3	
A1 people's flow	0.367	0.591	0.058	0.487
A2 cultural facilities	0.223	0.781	0.290	0.744
A3 public service facilities	0.233	0.790	0.267	0.750
A4 functionality	0.287	0.798	0.162	0.745
A5 cultural activities	0.190	0.648	0.402	0.618
B1 block location	0.734	0.276	0.145	0.636
B2 block safety	0.715	0.214	0.258	0.623
B3 spatial structure	0.719	0.231	0.408	0.737
B4 overall layout	0.595	0.407	0.364	0.652
B5 block density	0.728	0.311	0.248	0.687
B6 traffic conditions	0.654	0.263	0.331	0.607
C1 greening coverage	0.521	0.235	0.573	0.655
C2 block environment	0.517	0.194	0.682	0.769
C3 block sanitation	0.503	0.198	0.635	0.696
C4 architectural features	0.240	0.278	0.806	0.784
C5 visual effects	0.240	0.306	0.807	0.802
C6 activity experience	0.261	0.573	0.565	0.715

Note: Bid numbers indicate that the absolute value of load factor is greater than 0.4.

Table 4. AHP analysis results

Impact Factor	Eigenvector	Weight value	Maximum eigenvalue	CI value
A1 people's flow	0.959	5.640%		
A2 cultural facilities	0.983	5.780%		
A3 public service facilities	0.934	5.491%		
A4 functionality	0.906	5.331%		
A5 cultural activities	0.955	5.619%		
B1 block location	1.022	6.014%	17.000	0.000
B2 block safety	1.039	6.113%		
B3 spatial structure	1.000	5.883%		
B4 overall layout	1.004	5.903%		
B5 block density	0.951	5.594%		
B6 traffic conditions	0.990	5.821%		
C1 greening coverage	1.041	6.122%		
C2 block environment	1.019	5.994%		
C3 block sanitation	1.032	6.068%		
C4 architectural features	1.105	6.501%		
C5 visual effects	1.070	6.295%		
C6 activity experience	0.992	5.833%		

Conclusions

(1) The public service facilities and functionality of the historical block in Songcheng wall are relatively poor at the material element level. The architectural features are the core elements of the historical block in Songcheng wall to attract people.

(2) Through the analysis on temporal and spatial behavior characteristics of the historical block vitality, it is found that the change range of the spatial vitality in historical block on holidays is larger than that on weekdays, and a more concentrated vitality center will be formed in the scenic spots.

(3) The block location at the spatial scale level, block safety and greening coverage at the aesthetic attribute level, block sanitation, architectural characteristics and visual effects were the strong correlation factors affecting the block vitality

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