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Study on the Correlation between User Emotional Benefits and their Perception of Campus Outdoor Spaces

-- Take Longquan Campus of Yunnan University of Finance and Economics as an Example

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Abstract: There exists a certain correlation between spatial environments and emotional fluctuations, and emphasizing research on campus outdoor spaces holds significant importance in promoting students' emotional well-being. Based on relevant theoretical foundations, this study aims to explore the relationship between students and other users' perception of campus outdoor spaces and their emotional characteristics. The survey focuses on students and other campus users at Yunnan University of Finance and Economics. Firstly, it investigates their perspectives on outdoor space perception and its influence on emotions. Secondly, through questionnaires, the study gathers information about the subjects and their emotions. Building upon this data, the emotional characteristics of campus users in outdoor spaces are analyzed from multiple aspects. Finally, using the SPSS method, the study explores the correlation and influencing patterns between campus outdoor space perception and users' emotions, while proposing campus outdoor space planning and design strategies to enhance individual emotional benefits. This research provides a scientific basis for improving campus outdoor environments and enhancing students' emotional well-being.

Keywords: Outdoor Spaces; Perception; Emotions; Correlation Study.

1. Introduction and Research Progress

1.1. Introduction

Currently, urban development has shifted from pursuing quantity expansion to focusing on quality improvement. The impact of the built environment on human health has gradually become a focal point in urban planning and management. At the same time, the evaluation criteria for the quality of the built environment are constantly expanding. Not only does it need to meet the basic needs of users, but it also needs to consider the influence of spatial environments on people's physiological, psychological, and social health.

University campuses, as unique subsystems of urban ecosystems, play a crucial role in the development of their surrounding cities and areas. With the rapid development of education, higher demands have been placed on campus construction and environmental quality. Campus spaces are not only a part of the urban environment but also the most direct and intimate environment for students. A well-designed outdoor campus environment can subtly influence and motivate users, providing students and faculty with a platform for communication, reflection, and interaction. It plays a significant role in promoting campus vitality, public health, as well as improving student behaviors, activities, and perceptions.

Numerous studies have demonstrated the close relationship between emotional well-being and one's physical, mental, and social health. The spatial elements of the built environment can evoke different levels of positive or negative emotions in people (Dong Yan et al., 2012; Shao Peiren et al., 2011). The environment not only influences people's overt behaviors but also constrains their emotions and cognition. Therefore, investigating the relationship between students' perception of campus outdoor spaces and their emotions and proposing reasonable campus outdoor space design and renovation strategies to promote users' emotional benefits is of significant importance in promoting a healthy university campus. In the context of serious psychological imbalances and behavioral deviations among contemporary students, addressing these issues holds crucial practical significance.

1.2. Research Progress

The study of emotions originated from Western philosophy, and in the 1950s, scholars realized that "sacred spaces often have a powerful influence, capable of eliciting strong emotional responses" (Graham M, Stephens M, Hale S, 2013). In the mid to late 20th century, research on emotions began to enter the academic field, combining multiple disciplines such as sociology, psychology, and physiology, exhibiting diverse development characteristics (Zhu Hong, 2015). Under the influence of cultural theory's "spatial turn," the relationship between emotions and space has also received attention. Professor Kuntz (2019) believes that traditional qualitative research often loses focus on the impact of the environment, especially the material space, on individuals while pursuing results. Especially in the context of industrial society and the information age, as the quality of people's lives improves, the relationship between human behavior and the environment receives more attention, making the relationship between space and emotional activities a research focus.

Currently, research mainly focuses on the impact of spatial environments on individuals' physiological health, physical activity, and walking activities, while research on individual psychological health and emotional experiences is relatively scarce. With the increase in related research, the influence of spatial environments on individual psychological health can be divided into two aspects. On one hand, spatial environments indirectly affect individual emotional experiences and psychological health through individual

activities. Literature research found that current domestic studies mainly involve individual responses to aspects such as BIM levels, physiological indices, physical activity, respiratory health, exercise activities, outdoor recreational activities, social activities, daily activities, and travel activities. For example, the spatial environment can have different effects on the duration, intensity, and frequency of individual activities, and individual activities can trigger positive emotions and reduce negative emotions (Qiu Yue, 2019). Xiang Yuan's (2018) research indicates that the spatial environment has an impact on the physical activities of the elderly, and emotions significantly affect physical activities in terms of low and high public transportation accessibility. Liu Rui's (2014) empirical research shows that community public spaces indirectly influence residents' interpersonal relationships, while social capital and interpersonal relationships are essential factors affecting psychological health. Emotional health is a significant indicator of psychological health, which confirms the indirect influence of public spaces on individual emotions. On the other hand, spatial environments directly influence individual emotional experiences and psychological health. The research by Lin Yi, Chen Shenfei, and Xiao Xiaoxi (2022) demonstrates the significant impact of the spatial light environment of educational buildings on students' emotions. The research by Yin Xiaolan, Zhou Lujun, and Zhu Cuiying (2023) shows that school greening and environmental construction contribute to improving the positive emotions and psychological states of left-behind children. Related studies in environmental psychology have found that both tangible "hard environments" and intangible "soft environments" can affect individuals' emotions, cognition, and attitudes. For example, natural environments such as green spaces and natural scenery are more likely to evoke positive emotions, a sense of calmness, and vitality, enhancing individuals' intrinsic positive psychological capacities (Bjork et al., 2008; Song Hongbo et al., 2015).

In summary, in the context of campus outdoor space research, many scholars have focused on the planning and design of campus outdoor spaces, with qualitative research predominating. In particular, extensive discussions have been made on the planning, design, and suggestions for campus outdoor spaces, while quantitative research is still in the developmental stage. The influence of campus outdoor spaces on students' psychology receives less attention, and there is scarce research on the impact of campus outdoor spaces on student emotions. In selecting indicators to evaluate campus outdoor space characteristics, current research mainly focuses on environmental elements related to public space perception and vitality. In terms of individual emotional research, current related studies mainly focus on two aspects. On one hand, from the perspectives of sociology, neuroscience, and psychology, they explore factors affecting individual emotional health, typically researching aspects such as the environment, temperature, odor, and color to understand their influence on emotions. On the other hand, from the perspective of geography, they explore the emotional distribution characteristics of different types of spaces. However, there is very limited research on the impact of campus outdoor public space environments on the emotions of college students. In terms of research scale, the discipline of human habitation has always been concerned about this issue, but there are still many shortcomings. Existing research is mostly conducted at the macro level, and the research content has not been specifically applied to the concrete application level of public space cognition, spatial layout, and service facilities. There is a lack of research at the micro level, i.e., the correlation mechanism between campus outdoor public space cognition and individual emotional benefits. This article mainly focuses on the perception of campus outdoor spaces by students and other users, using subjective assessment methods to quantitatively explore the correlation between emotional experiences and perceived characteristics of campus outdoor spaces.

2. Theoretical Analysis and Framework

University life is an important and meaningful stage in a person's life, providing comprehensive education and influencing the establishment of thoughts, behavior patterns, worldview, and values, spanning one's entire life. The educational environment is not limited to specific indoor functional spaces like classrooms, libraries, and laboratories; campus outdoor spaces are also essential educational spaces. As part of the urban environment, campus outdoor spaces primarily provide places for outdoor activities, which are crucial avenues for social interaction and experiencing nature. Therefore, optimizing campus outdoor spaces is beneficial for attracting more people to engage in various activities outdoors, improving psychological health, and managing emotions better.

Environmental psychology studies the mutual influence between individuals and their surrounding environment, including the shaping of personality by natural and built environments. According to environmental psychology theory, the environment can affect people's emotions and behavior. Living in beautiful and pleasant natural environments for an extended period can generate a pleasant mood and reduce stress. A beautiful environment helps eliminate fatigue, enhances emotional well-being, and rejuvenates the spirit, while a poor environment can affect emotions and mental states, leading to anxiety and discomfort (Wu Jingchu, 1986). Environmental behavior studies the relationship between human behavior and the environment, exploring how people perceive, evaluate, select, and use different environments, as well as how they modify the environment to meet needs and goals. It emphasizes the impact of the environment on human behavior and how people change the environment to meet their needs and goals. Research covers the influence of the environment on perception, emotions, behavior, and social relationships, as well as how to improve life by modifying the environment. Furthermore, environmental behavior studies also investigate the impact of the environment on people's health and psychological conditions, and how to improve health and psychological well-being by changing the environment. Environmental behavior provides effective methods for people to understand and modify their environment to enhance their quality of life (Li Daozeng, 1999).

The Stress Recovery Theory (SRT) posits that recovering from stress in natural environments is an evolutionary outcome, whereas long-term exposure to urban environments hinders stress recovery for individuals. Ulrich (1991) demonstrated this theory through experiments. He induced stress in students by showing them videos of different natural environments or urban traffic, and then observed their stress recovery. The results showed that when participants watched

videos of natural scenery, stress levels and physiological measurements rapidly and significantly recovered, while watching videos of urban environments did not have the same effect. According to the Stress Recovery Theory, natural environments help individuals recover from stress by providing visual stimuli associated with survival and subjective well-being. Related research indicates that community green spaces can enhance individual physical exercise, promote social interactions, and contribute to physical and mental health. The quantity of green spaces is significantly related to residential satisfaction, self-reported health status, and a reduction in anxiety and depression. In green spaces and activities, people can experience positive emotions such as vitality, pleasure, and satisfaction while reducing negative emotions like anxiety, tension, fatigue, and depression (Maas Jolanda, 2006; Maas J et al., 2009).

Moreover, the Social Support Theory suggests that the social support resources provided by a place can affect a person's psychological health (Wen Wusen et al., 2000). Campus outdoor spaces, as an integral part of urban public spaces, provide students with spaces for social interaction and activities. Here, teachers and students can encounter each other unexpectedly, communicate, and stimulate wisdom and creativity. Students can find their place and sense of existence in extracurricular environments and the influence of their teachers, gain recognition and potential sense of value, and discover their unique characteristics. Therefore, social interaction positively influences students' emotions and behavior by providing emotional support, alleviating feelings of loneliness, enhancing identity, offering cognitive support, sharing joy, building emotional connections, and relieving stress. Hence, the opportunities for social interaction provided by campus outdoor spaces become particularly important. Optimizing campus outdoor spaces can facilitate effective interactions among students, improve their emotional states, and shape their behavior.

Based on the previous studies of campus outdoor space characteristics and the preliminary research status and interview results at the micro level, this paper defines the cognition of emotional benefits in campus outdoor spaces as consisting of 14 internal factors, namely, the tranquility of the atmosphere, lighting, wind comfort, temperature, building spacing, building scale, aesthetic appeal, space accessibility, land use mix, water bodies, greenery, sculptures, architectural elements, and colors. The subsequent study will focus on analyzing and examining the mechanism of the impact of these 14 cognitive observation variables on students' emotions. The theoretical framework based on the above analysis is shown in Figure 1.



Figure 1. Research Concept Model

3. Research Design

3.1. Research Variables and Operationalization

(1) Campus Outdoor Space Perception: The selection of observed variables is based on a comprehensive review of related studies on outdoor space characteristics and preliminary research on campus outdoor spaces at the micro level. The core explanatory variables in this study include tranquility, lighting, wind comfort, temperature, building spacing, building scale, aesthetics, spatial accessibility, land use mix, water features, greenery, sculptures, architectural features, and colors. Data for these variables are collected through a survey questionnaire, where respondents rate their perception of the emotional benefits associated with the 14 factors in campus outdoor spaces. The responses are measured using a 5-point Likert scale, with 1-5 indicating increasing degrees of perception intensity.

(2) User Emotions: In this study, the emotions of campus outdoor space users, including positive and negative emotions, are considered as the dependent variables. The PANAS (Positive and Negative Affect Scale) questionnaire is used to assess emotional health. This psychological measurement scale was introduced by David Watson, Lee Anna Clark, and Auke Tellegen in 1988 and assesses the user's levels of positive and negative emotions. The scale consists of 20 5-point scale items.

The PANAS questionnaire includes two emotion dimensions: positive affect and negative affect. The positive affect scale includes 10 adjectives that describe positive emotions, such as proud and enthusiastic. A higher score on the positive affect scale indicates a person's high energy, focus, and joyful emotional state, while a lower score indicates indifference. The negative affect scale consists of 10 adjectives that describe negative emotions, such as distressed and guilty. A higher score on the negative affect scale indicates the person subjectively feels confusion and distress, while a lower score indicates calmness. The scale analyzes the scores for positive and negative affect separately. Participants are asked to circle the appropriate response after each adjective based on their actual experiences in the past 1-2 weeks. Each adjective has five response options: "very slightly or not at all," "a little," "moderately," "quite a bit," and "extremely."

(3) User Behavior: Campus outdoor space users include students, faculty and staff, family members of faculty and staff living on campus, and retired teachers. Four factors, namely the frequency, duration, and types of activities performed in campus outdoor spaces, as well as the strength of the willingness to engage in these activities, are considered as control variables. Data on user behavior are collected through interviews with campus users who are currently in outdoor spaces. A subjective evaluation method is used, where participants are invited to experience the outdoor space landscape and then fill out the positive and negative affect scale in real-time to obtain emotional experience data from different participants.

3.2. Sample Selection and Study Area

In the unique environment of the university campus, campus users include students, faculty and staff, staff families living on campus, and retired teachers. Among them, students are the primary group of campus environment users. This study will focus on students as the main research subjects, with the emotions and effects of faculty and staff, staff families living on campus, and retired teachers as supplementary research.

To ensure the accuracy of the questionnaire survey, this survey will use random sampling to select a group of users within Yunnan University of Finance and Economics campus for questionnaire distribution. The distribution of questionnaires will be carried out within the Longquan campus of Yunnan University of Finance and Economics to

ensure that the recipients are students, faculty, staff families living on campus, and retired teachers within the university, not external individuals. This ensures the accuracy of the target population. The distribution of questionnaires will be conducted on both weekdays and weekends throughout the day, to cover users of different ages, genders, and educational backgrounds.

Table 1. Variable Operationalization

Latent Variable	Latent Variable	Assignment Explanation
Cognitive Perception of Campus Outdoor Spaces	Ambient Tranquility Level	Very Noisy (1) ~ Very Quiet (5)
	Lighting	Very Noisy (1) ~ Very Quiet (5)
	Wind Comfort Level	No Impact (1) ~ Very Influential (5)
	Temperature	No Impact (1) ~ Very Influential (5)
	Building Spacing	Very Narrow (1) ~ Very Spacious (5)
	Building Spacing	Very Narrow (1) ~ Very Spacious (5)
	Aesthetic Attractiveness	Very Narrow (1) ~ Very Spacious (5)
	Spatial Accessibility	Very Narrow (1) ~ Very Spacious (5)
	Land Use Mix	Completely Absent (1) ~ Extremely Adequate (5)
	Water Bodies	Completely Absent (1) ~ Extremely Adequate (5)
	Greenery	Completely Absent (1) ~ Extremely Adequate (5)
	Sculptures	Completely Absent (1) ~ Extremely Adequate (5)
	Architectural Elements	Completely Absent (1) ~ Extremely Adequate (5)
	Color	Completely Absent (1) ~ Extremely Adequate (5)
Positive Emotion	Interested	Very Mild (1) ~ Very Intense (5)
	excited	Very Mild (1) ~ Very Intense (5)
	strong	Very Mild (1) ~ Very Intense (5)
	enthusiastic	Very Mild (1) ~ Very Intense (5)
	proud	Very Mild (1) ~ Very Intense (5)
	alert	Very Mild (1) ~ Very Intense (5)
	inspired	Very Mild (1) ~ Very Intense (5)
	determined	Very Mild (1) ~ Very Intense (5)
	attentive	Very Mild (1) ~ Very Intense (5)
	active	Very Mild (1) ~ Very Intense (5)
Negative Emotion	distressed	Very Mild (1) ~ Very Intense (5)
	upset	Very Mild (1) ~ Very Intense (5)
	guilty	Very Mild (1) ~ Very Intense (5)
	scared	Very Mild (1) ~ Very Intense (5)
	hostile	Very Mild (1) ~ Very Intense (5)
	irritable	Very Mild (1) ~ Very Intense (5)
	ashamed	Very Mild (1) ~ Very Intense (5)
	nervous	Very Mild (1) ~ Very Intense (5)
	jittery	Very Mild (1) ~ Very Intense (5)
	afraid	Very Mild (1) ~ Very Intense (5)

4. Results Analysis

4.1. Questionnaire Reliability Test

In this study, the internal consistency reliability of the questionnaire was assessed using Cronbach's α (Cronbach's alpha coefficient) in order to measure the questionnaire's reliability. The Cronbach's α value ranges from 0 to 1, with values closer to 1 indicating higher questionnaire reliability. Theoretically, a value greater than 0.7 signifies a high level of reliability for the questionnaire. After the completion of data collection, the raw data was stored using Microsoft Office Excel, and then the questionnaire data was imported into SPSS for analysis. An internal consistency reliability test was conducted on the questionnaire items, resulting in a Cronbach's α coefficient of 0.912. This indicates that the questionnaire possesses good reliability and a high level of internal consistency. Refer to Table 2 for details.

Table 2. Questionnaire Validity and Reliability Assessment

Variables	Item Count	Cronbach' α	KMO	Bartlett's Sphericity Test
Overall Questionnaire	34	0.912	0.7	<0.001

4.2. Questionnaire Validity Assessment

The validity assessment of the questionnaire in this study was conducted through structural validity, which refers to the accuracy of the questionnaire items. Structural validity reflects the correspondence between the measurement results and the items being measured. There are two indicators for structural validity: Kaiser-Meyer-Olkin (KMO) value and

Bartlett's sphericity test value. The KMO value should be greater than 0.7, and Bartlett's sphericity test value should be less than 0.01.

Upon analysis of the questionnaire data using SPSS, the KMO value was found to be 0.7, and the Bartlett's sphericity test result was 0.000. This indicates that the structural validity of the questionnaire is good, and there is correlation among the various factors, allowing for further factor analysis to be conducted. Refer to Table 2 for details.

4.3. Statistical Analysis of Sample Characteristics

A total of 73 valid questionnaires were collected in this survey. Among the 73 respondents, there were 18 males, accounting for 24.66% of the total respondents, and 55 females, constituting 75.34% of the total respondents, indicating a slight difference in the number of male and female participants.

Regarding the distribution of age groups, due to the presence of only 7 different age ranges in the sample, two age groups (31-40 years old, 60 years and above) had no sample data, making them absent from the sample. The age group with the highest representation was 18-25 years old, with 57 respondents, making up 78.08% of the sample. The next age group was 26-30 years old, accounting for 15.07%.

In terms of educational background, individuals with a bachelor's degree were the largest group, constituting 43.84% of the total respondents. The next group was those with a postgraduate degree or higher, accounting for 39.73%. Respondents with associate degrees and high school/vocational school diplomas made up 9.59% and 4.11%, respectively. Respondents with junior high school education or below had the lowest representation, at 2.74%.

Regarding the occupational status of the respondents, students were the primary group, making up 80.82% of the total respondents. The next group was labeled as "other," comprising 13.70%. Faculty members and family members of faculty living on campus accounted for 4.11% and 1.37%, respectively.

In terms of the academic year of student respondents, postgraduate students had the highest representation, at 31.51%. The next highest were third-year students and third-fourth year students, each accounting for 15.07% and 12.33% respectively. First-year and second-year students had relatively similar representation, constituting 10.96% and 9.59%, respectively. Other groups had the smallest representation, at 1.37%.

Table 3. Analysis of Sociodemographic Characteristics

Variables	Options	Frequency	Percentage	Variables	Options	Frequency	Percentage
Gender	Male	18	24.66	Age	Below 18 years old	2	2.74
	Female	55	24.66		18~25	49	78.08
Education	Junior High School and Below	2	2.74		26~30	10	15.07
	High School or Vocational School	3	4.11		31~40	0	0
	High School or Vocational School	7	9.59		41~50	0	1.37
	College Bachelor's Degree	32	43.84		51~60	1	2.74
	Postgraduate and above	29	39.73		Above 60	0	0
Occupation Status	Student	59	80.82	Grade	Freshman	8	10.96
	Staff	3	4.11		Freshman	7	9.59
	Staff Family Residing on Campus	1	1.37		Sophomore	11	15.07
	Retired Teacher	0	0		Junior	9	12.33
	Other	10	13.70		Senior	23	31.51
					Postgraduate	1	1.37

4.4. Influence of Sociodemographic Characteristics on Emotions among Participants

Multiple regression analysis was performed using the positive and negative emotion scores from the PANAS scale as dependent variables and sociodemographic characteristics as independent variables. Before conducting the regression analysis, the sociodemographic characteristic variables need to be dummy-coded. The results of the regression analysis are presented in Table 4.

Regarding positive emotions, apart from gender and age factors, educational level and academic year factors significantly influenced students' positive emotions ($p < 0.05$). In terms of educational level, with high school or vocational school as the reference group, the data suggests that postgraduate and above levels have a significantly negative impact on positive emotions. However, junior high school and below, college diploma, and bachelor's degree levels do not have a significant impact on positive emotions. Higher educational levels are associated with lower positive emotion scores among students. In terms of academic year, compared to other groups, first-year students, fourth-year students, and postgraduates had lower positive emotion scores. This may

indicate lower levels of enthusiasm, happiness, or joy among these students. As academic years progress, positive emotion scores first rise and then decline. This trend could be related to academic pressure. First-year students might be transitioning to university life and facing new academic challenges, leading to higher stress and lower positive emotions. Fourth-year students might experience pressure related to graduation and future career planning, affecting their emotions. Postgraduate students may need to deal with increased demands in terms of studies and research, leading to higher stress and lower positive emotions.

Regarding negative emotions, gender and age factors had no significant impact on students' negative emotion scores ($p = 0.365$, $p = 0.426$). Other factors had a significant impact on negative emotion scores ($p < 0.05$). Higher educational levels were associated with lower negative emotion scores, possibly because higher-educated students develop better coping mechanisms and emotional management skills for academic and personal challenges. They might be more capable of handling stress, resulting in reduced experience of negative emotions. In terms of academic year, compared to other groups, postgraduate students had the lowest negative emotion scores. This might be due to postgraduates' specialized and self-selected subjects, which could reduce stress and negative emotions associated with academic choices, resulting in lower negative emotion scores. First-year, second-year, and third-year students had similar negative emotion scores, while fourth-year students had a sudden increase in negative emotion scores. This might be attributed to the pressure of graduation and employment. They might start contemplating future career development and planning, facing uncertainty and challenges that could lead to an increase in negative emotions.

Table 4. Differential Regression Analysis of Sociodemographic Characteristics on Emotions

		Positive Emotion		Negative Emotion	
Variable	Options	Unstandardized Coefficient	F-test	Unstandardized Coefficient	F-test
Gender	Male	1	2.318	1	0.831
	Female	-2.574		-2.599	
Education	Junior High School and Below	-6.500		-8.667	
	High School or Vocational School	1	3.628 (**)	1	7.875 (**)
	High School or Vocational School	0.714		-1.952	
	College Bachelor's Degree	-3.312		-7.604	
	Postgraduate and above	-7.103		-17.425	
Age	Below 18 years old	1	0.614	1	0.977
	18~25	4.614		-8.877	
	26~30	6.273		-10.000	
	41~50	2.000		-3.000	
	51~60	1.500		-19.500	
Grade	Freshman	1	4.891 (**)	1	3.903 (**)
	Freshman	-1.858		-0.950	
	Sophomore	5.552		-0.486	
	Junior	4.994		-0.564	
	Senior	-3.289		6.356	
	Postgraduate	-2.516		-8.765	

Note: ** indicates significance at the 0.05 level.

4.5. Analysis of the Cognitive Emotional Benefits of Campus Outdoor Spaces on Participants' Emotions

Table 5. Correlation Analysis Results

	Positive Emotion	Negative Emotion
Ambient Tranquility Level	0.038	-0.176
Lighting	0.198	0.023
Wind Comfort Level	-0.206	-0.212
Temperature	0.218	0.055
Building Spacing	0.187	0.002
Building Spacing	0.341**	0.240*
Aesthetic Attractiveness	0.347**	0.164
Spatial Accessibility	0.278*	0.174
Land Use Mix	0.146	0.017
Water Bodies	0.052	0.025
Greenery	0.091	-0.234*
Sculptures	0.424**	0.173
Architectural Elements	0.305**	0.105
Color	0.251*	-0.050

* $p<0.05$ ** $p<0.01$

Following the principles of the PANAS scale, this study discusses the measurement of positive and negative emotions among students separately. Through correlation analysis between cognitive observations and positive/negative emotion scores (Table 5), among the 14 cognitive observation

variables, building size, aesthetic attractiveness, spatial accessibility, sculptures, architectural details, and color were all significantly positively correlated with students' positive emotions. The number of sculptures in the campus outdoor space exhibited the strongest correlation. Building size was positively correlated with students' negative emotions, while greenery was significantly negatively correlated with students' negative emotions. This may be because larger building sizes could imply higher occupancy, leading to increased stress and discomfort for students in crowded campus environments, thus contributing to higher levels of negative emotions. Greenery often offers more natural elements and a sense of comfort, helping to alleviate students' psychological stress and fatigue. A well-greened environment allows students to relax and rest more effectively, thereby reducing negative emotions. No other cognitive variables exhibited correlations with students' negative emotions, suggesting that the impact mechanism of the cognitive emotional benefits of campus outdoor spaces on students' negative emotions is not clear.

5. Conclusion

This study aimed to investigate the influence and relationships between students' cognitive perceptions of campus outdoor spaces and their emotions. By conducting surveys among students, faculty members, on-campus faculty family members, and retired teachers at Yunnan University of Finance and Economics, this study established a database containing 73 questionnaires and 2190 samples. In selecting observation variables, this study comprehensively considered 14 variables, including ambient tranquility, lighting, wind comfort, building spacing, building size, aesthetic attractiveness, spatial accessibility, land use mix, water bodies, greenery, sculptures, architectural details, and color. The PANAS scale was used for emotion quantification, providing comprehensive insights into students' perceptions of campus outdoor environments and their effects on student emotions. Given that the sample was limited to users within the campus of Yunnan University of Finance and Economics, primarily composed of students whose thoughts are in a developmental phase, the findings' generalizability has certain limitations. Students' thoughts are subject to fluctuations and self-regulation, resulting in varied perceptions of the same environment and similar perceptions of different environments. Therefore, future research could expand the sample size, include diverse campus environments and regions, and employ additional research methods to validate and deepen the understanding of this field.

In summary, this study holds significant academic and practical value in comprehending the impact and relationships between cognitive perceptions of campus outdoor spaces and user emotions. The research results provide guidance and insights for campus planning and design, aiming to enhance the campus outdoor environment and promote emotional well-being among students. It is hoped that this study will offer fresh ideas and inspiration to the academic community and practitioners, driving the development of campus environments to provide students with high-quality and comfortable spaces for learning and living.

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