

The Impact of Campus Planning on Students' Mental Health under COVID-19 Prevention and Control

A Case Study of Several Universities in China

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Abstract

Urban governance in the era of COVID-19 epidemic is a common problem faced by all parts of the world. In this process, people's physical and mental health are equally important. Taking three universities in China as examples, through extensive questionnaires and interviews, this paper investigates the scope of activities of college students living in different campus environments and management forms, the use of campus space and facilities, and the psychological changes of students, since the campus closure and control of the epidemic. The study found that campus planning and physical environment have a significant impact on the psychology of young people who are closed. Among them, sufficient effective activity area, high visual green space rate and space openness are the top three that have a positive impact on mental health. At the same time, the narrow range of activities, lack of privacy space, and monotonous spatial form are all negative factors that affect the mental health of teachers and students. On this basis, we put forward suggestions for the optimization of mental health-oriented campus planning, including planning sufficient and diverse collective activities and sports venues, and matching open enough public spaces with enough private privacy spaces.

Keywords

Mental health, Campus planning, COVID-19 epidemic prevention and control

1. Introduction

1.1. Background

Since the COVID-19 epidemic, the flow of factors in global cities has been restricted, and healthy cities and healthy people have become the new goals of urban governance. Although Chinese cities have high population density, the epidemic prevention and control effect is remarkable under strict epidemic prevention policies and measures. At the same time, the strict epidemic prevention policy has also brought many problems, among which the impact on people's mental health is gradually emerging. In January 2020, the National Health Commission of China released "Principles for Emergency Psychological Crisis Intervention for COVID-19 Pneumonia Epidemic"^[1], which incorporated psychological crisis intervention into the overall deployment of disease prevention and paid more attention to the mental health of people in the post-epidemic era.

Colleges and universities are representative places where the floating population gathers. The high mobility and high density of students in colleges and universities are difficult areas for epidemic prevention and control. Chinese colleges and universities often have to take measures to close schools to prevent the spread of the epidemic. According to statistics from the Ministry of Education of PRC, by 2021, 98% of primary and secondary schools in the country have achieved closed management ^[2], and most colleges and universities have generally adopted different levels of school closure measures. After the outbreak of the Shanghai epidemic in March 2022, about 720,000 college students in more than 50 colleges and universities have all experienced a fully closed mode of management. Although this kind of long-term physical closed management is an effective method in dealing with the spread of the epidemic, at the same time, the proportion and frequency of psychological problems among students on campus have risen sharply^[3], which needs to be widely paid attention to.

1.2. Literature Review

Looking back at the existing research, the impact of the COVID-19 epidemic on people's mental health has received extensive attention since the beginning of the epidemic^[4], but most of the research objective are concentrated in several key groups, including confirmed patients and quarantined personnel^[5], frontline health professionals and administrative staff^[6], close contacts and patients with suspected infection^[7], etc.; and insufficient attention is paid to the mental health of college students. In fact, college students are generally facing worse situation^[8], as they may face a longer period of closed management^[9], and most of them are not isolated alone but with roommates.

Chao B et al. (2021)^[10] focused on the mental health of college students from the perspective of psychiatry, and conducted research on epidemic prevention and control and college students' mental health in the form of questionnaires. *Abuhmaidan Y* (2020) ^[11] conducted a quantitative analysis and found that various space closures had a negative impact on their mental health, especially in the negative emotions such as panic, anxiety and depression ^[12]. *Zhang R* (2021)^[13] research shows that appropriate physical activities can have a positive impact on the mental health of college students. But as a campus that provides space for physical activity. Even though the campus is a carrier that provides various activity spaces, few studies have investigated the impact of its planning and design on the mental health of college students.

To sum up, planning from the perspective of people's mental health under the epidemic is an important proposition for the development of future disciplines, but the existing research has paid little attention to the mechanism of space quality on the mental health of college students during the epidemic. In addition, the impact on students' mental health is less considered in campus planning^[14].

Therefore, this study takes several representative colleges and universities in China as examples. Through real questionnaires and interview data to study the impact of closed management on the mental health of Chinese college students from the perspective of campus planning, and the relationship between this impact and spatial design.

2. Data and methods

2.1. Research Objects

During the period from March 1, 2022 to May 31, 2022, in order to study how different campus planning and spatial forms will affect students' mental health, this study selected Southeast University (SEU), Harbin Institute of Technology (Shenzhen) (HITSZ) in South China and Shandong Jianzhu University (SJU) in North China are the main research cases, and students from the three universities are the main research objects.

The research mainly adopts random sampling method, snowball sampling method and convenience sampling method, and conducts a sampling survey on the undergraduates of the three universities mentioned above. All respondents participated voluntarily and signed informed consent.

2.2. Data and Research Methods

2.2.1 Data source and preprocessing

For the three universities selected by this research, namely Southeast University, Harbin Institute of Technology (Shenzhen), and Shandong Jianzhu University, the sample survey data of college students and campus information data of universities were mainly collected.

(1) Sample survey data of college students

Through the distribution of online questionnaires, a total of 332 respondents from the three universities completed the questionnaires. After excluding 18 questionnaires that did not meet the requirements with vague information and other problems, the final valid questionnaires were 314 (94.58% effective rate). In addition, in order to balance the research samples of various universities, this study randomly selected 100 questionnaires from each of the three universities as the final data. The basic information characteristics of college students are shown in Table 1.

Table 1. Basic information characteristic table of college students. Source: Author's own drawing.

Variables	Grouping	Frequency	Relative Frequency
Gender	Male	77	25.67%
	Female	223	74.33%
Academic Subjects	Urban and Rural Planning	134	44.67%
	Architecture	91	30.33%
	Landscape architecture	31	10.33%
	Power Engineering	7	2.33%
	other	37	12.33%
Grade	First year of undergraduate	7	2.33%
	Undergraduate years 2-3	45	15.00%
	Undergraduate years 4-5	26	8.67%
	First year of master's degree	35	11.67%
	Second year of master's degree	66	22.00%
	Third year of master's degree	98	32.67%
	PhD candidate	23	7.67%

(2) University campus information data

According to the data results of the questionnaire survey, the college students who participated in the survey were from Southeast University (Sipailou Campus), Harbin Institute of Technology (Shenzhen Campus), and Shandong Jianzhu University (Licheng Campus). According to the specific campus information of the above universities, the research has sorted out the campus information data of the three universities through the integration of interviews and network data, as shown in Table 2.

Tabel 2. University campus information data sheet. Source: Author's own drawing.

	SEU	HITSZ	SJU
Campus area	43.9ha	154 ha	135ha
Campus space form	small campus	college town	independent university campus
Epidemic prevention intensity	weak closure	strong closure	strong closure
Dormitory area	20	15	25
Number of people per dormitory	4	4	6

2.2.2 Specific research methods and tools

(1) Questionnaire survey method

Based on the preliminary research hypothesis that different campus planning and space forms will have different effects on students' mental health, a questionnaire "Investigation on the Impact of College Planning on Students' Mental Health under the New Crown Epidemic" is designed. The questionnaire is divided into five parts: basic information of respondents, information on public space in colleges and universities, information on campus epidemic prevention and control, the impact of campus prevention and control on students, and the measurement of students' psychological anxiety during campus prevention and control.

Among them, the basic information of the respondents and the public space information of colleges and universities belong to the basic information collection of the interviewed students and universities, including the names of universities, campus names, majors, genders, and grades of the interviewed students. At the same time, the type, quality, supply and demand of public activity space planned by colleges and universities were collected.

The information section on campus epidemic prevention and control mainly collects information such as the management and control measures and duration of colleges and universities under the new crown epidemic.

The impact of campus prevention and control on students is collected through the subjective evaluation of respondents, comparison of the frequency of entering and leaving the campus before and after the outbreak, comparison of the frequency of public space use, and evaluation of public space. Mental health played a positive role.

The general anxiety scale (GAD-7) recommended by the fifth edition of the "Diagnostic and Statistical Manual of Mental Disorders" published by the American Psychiatric Association^[15] is used to measure the psychological anxiety of students during the campus prevention and control period. It is an effective tool for cases and has good reliability and validity in previous studies, and can effectively measure the mental health of college students during the epidemic control period on campus.

(2) Statistical methods

Excel, Access and other software are used to establish a database, and the sample survey data of college students and college campus information data are sorted out, and SPSS software is used to carry out descriptive statistics, correlation analysis and regression analysis on the data, and to study the statistical significance of different data.

3. Results

3.1. Mental Health of College Students under Epidemic Prevention and Control

According to the statistics of the questionnaire survey, in the question "Has the new crown pneumonia epidemic affected your daily activities?", 32.58% of the students surveyed believed that the epidemic had a great impact on their normal life, and 36.36% of the respondents believe that the epidemic has had a serious impact; and in the statistics of the question "Has the new crown pneumonia epidemic and its follow-up control measures had a negative impact on your psychological state?" "Severe" accounted for 14.39%, and only 2.27% of the interviewed students believed that the new crown epidemic and its prevention and control measures did not affect their psychological state.

It can be found that the COVID-19 epidemic and the resulting school closures, daily nucleic acid testing and other measures have had a serious impact on students' daily life and mental health. This part will complete the evaluation of the mental health of 300 interviewed college students based on the Generalized Anxiety Scale (GAD-7), and study the mental health of college students under epidemic prevention and control.

According to the scoring standard adopted by GAD-7, the scores are divided into 4 groups: 0-5, 6-9, 10-14, 15-21, corresponding to no anxiety, mild anxiety, moderate anxiety and severe anxiety, respectively. Overall, the average psychological anxiety score of the 300 interviewed college students was 7.23, indicating that under the prevention and control measures of the new crown pneumonia epidemic in colleges and universities, the college students are generally in a state of mild anxiety.

Tabel 3. Comparison of statistical characteristics of psychological anxiety degree of college students. Source: Author's own drawing.

	SEU	HITSZ	SJU
Average	6.96	8.09	6.64
Median	7.00	6.00	7.00
Mode	7.00	6.00	7.00
Standard Deviation	4.01	5.47	4.74
Variance	16.07	29.90	22.43
Kurtosis	-0.55	0.57	2.99
Skewness	0.28	1.10	1.15
MIN	0.00	0.00	0.00
MAX	15.00	21.00	21.00

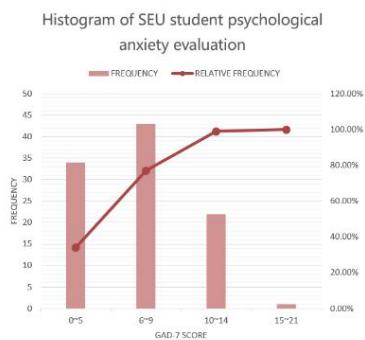


Figure 1. Histogram of SEU student psychological anxiety evaluation. Source: Author's own drawing.

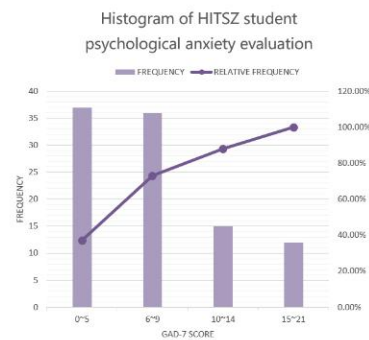


Figure 2. Histogram of HITSZ student psychological anxiety evaluation. Source: Author's own drawing.

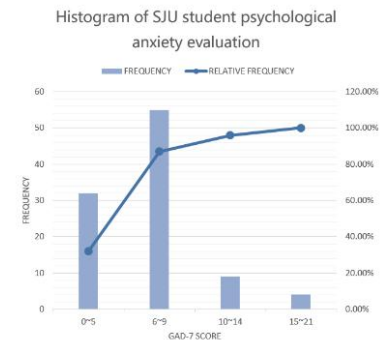


Figure 3. Histogram of SJU student psychological anxiety evaluation. Source: Author's own drawing.

The GAD-7 score data of the three universities were descriptive statistics (see Tab.3), and combined with Fig.1- Fig.3, it can be found that the psychological anxiety of HITSZ students is the most serious, followed by SEU students, and SJU students have the least psychological anxiety.

Among them, the average score of psychological anxiety of HITSZ students is the highest among the three universities (8.09), the median and mode are the lowest (6.00), and the variance (29.90) and standard deviation (5.47) are the highest. Combining with the information shown in Fig. 2, we can see that , the psychological anxiety level of HITSZ students showed a decreasing trend from no anxiety to severe anxiety, with a higher degree of dispersion, and compared with the other two universities, HITSZ had the most students without anxiety and severe anxiety. It can be considered that the mental health level of HITSZ students is quite different, and the overall health status is poor. It should be noted that some students have serious anxiety.

The average score of psychological anxiety of SEU students is at the middle level (6.96) among the three universities, with the lowest variance (16.07) and standard deviation (4.01), and the kurtosis value is the only negative value (-0.55) among the three universities. Compared with the other three anxiety levels, the number of students with severe anxiety is very small; combined with the information shown in Fig.1, the differences in the psychological anxiety level of SEU students are the smallest, and the students with the three anxiety levels basically show an equal distribution. It can be considered that the overall mental health of SEU students is relatively good, and the psychological anxiety symptoms are concentrated in moderate to mild levels.

The average score of psychological anxiety of SJU students is the lowest among the three universities (6.64), while its variance (22.43), standard deviation (4.74) and kurtosis (2.99) are the highest. Compared with universities, SJU has the least number of students without anxiety, and the most students with mild anxiety. It can be considered that its students have the best overall mental health, and most students have mild psychological anxiety.

Under the similar prevention and control efforts of the new crown pneumonia epidemic, the psychological anxiety levels of students in the three universities are quite different. This phenomenon has a certain relationship with the difference in academic pressure and personal special circumstances. Severe restrictions, it can be speculated that a suitable public activity space in the campus will play a positive role in alleviating the negative emotions of students.

3.2. The Influence of Spatial Scale and Form on the Mental Health of College Students

During the school closure period, the places that students can reach are limited, which has caused more students to have negative emotions such as anxiety and depression. Comparing the frequency of use of campus public activity spaces before and after the COVID-19 epidemic, it can be found that under the prevention and control measures brought about by the COVID-19 epidemic, outdoor playgrounds, indoor gymnasiums, college activity center, and other public spaces that provide sports or group activities are relatively frequently used, while the frequency of use of casual dining spaces has dropped significantly (Tab. 4). Specifically, with the increasing inconvenience of entering and leaving the school, some of the needs of students have been transferred to inside of the school, and more students would like to play sports, leisure, social activities and other activities in the school. It is worth mentioning that most of the students agree that the different scales and forms of space on campus can bring different degrees of relief to their negative emotions.

Specifically, the effective area of activities directly affects the activity range of students, and the space form affects the richness of students' activities, which will affect the experience of space use and thus affect the emotions and mental health of students.

First of all, the psychological oppression brought by the closed environment is reflected in the spatial scale. For example, among the questions "Which campus public activity spaces have played a positive role in regulating your personal emotions under the epidemic control situation?", we found that open-air playgrounds, large-area landscape green spaces, indoor gymnasiums, large-area activities squares and other outdoor sports facilities are ranked 1-5 in the evaluation score (Tab.4). It shows that under the situation of epidemic control, students prefer larger-scale spaces and believe that large-scale open spaces play a positive role in relieving anxiety, especially indoor and outdoor activity spaces that can be combined with sports activities. For example, the open-air playground is the most popular choice for students.

Tabel 4. Various evaluations of public activity spaces. Source: Author's own drawing.

Evaluation of the frequency of public space use before the epidemic		Evaluation of the frequency of use of public spaces during the epidemic		Evaluation of the positive effect of public activity space	
Options	Average score	Options	Average score	Options	Average score
Outdoor Playground	5.77	Outdoor Playground	5.59	Outdoor Playground	6.3
Indoor Stadium	3.78	Indoor Stadium	2.75	Large area of Landscape Green Space	2.95
Casual Dining Facilities such as Cafes	2.67	College Activity Center	2.04	Indoor Stadium	2.64
College Activity Center	2.51	large Event Plaza	1.95	large Event Plaza	2.49
large Event Plaza	2.48	Small Scale Park and Square	1.67	Other Outdoor Sports Facilities	2.48
Other Outdoor	2.01	Other Outdoor	1.58	Rally Lawn	2.27

Sports Facilities		Sports Facilities			
Small Scale Park and Square	1.86	Large area of Landscape Green Space	1.45	College Activity Center	2.11
Rally Lawn	1.68	Other Event Venues	1.23	Small Scale Park and Square	2.08
Large area of Landscape Green Space	1.67	Casual Dining Facilities such as Cafes	1.13	Casual Dining Facilities such as Cafes	1.92
Other Event Venues	0.62	Rally Lawn	1.09	Other Event Venues	0.66

Note: The average score of the options in the ranking questions reflects the comprehensive ranking of the options. The higher the score, the higher the comprehensive ranking. The calculation method is: average comprehensive score of options = ($\sum$ frequency $\times$ weight) / number of people filling this question.

At the same time, we also found that the frequency of use of indoor space became less and the frequency of use of outdoor space increased during the school closure period. For example, the frequency of use of indoor gymnasium in HITSZ decreased significantly, and the popularity of SJU Cafe was not as good as before. Combined with the interview we inferred that this was because indoor space generally adopted stricter prevention measures. In contrast, outdoor sports and event venues have a healthier environment and lower risk of virus transmission (Fig. 4).

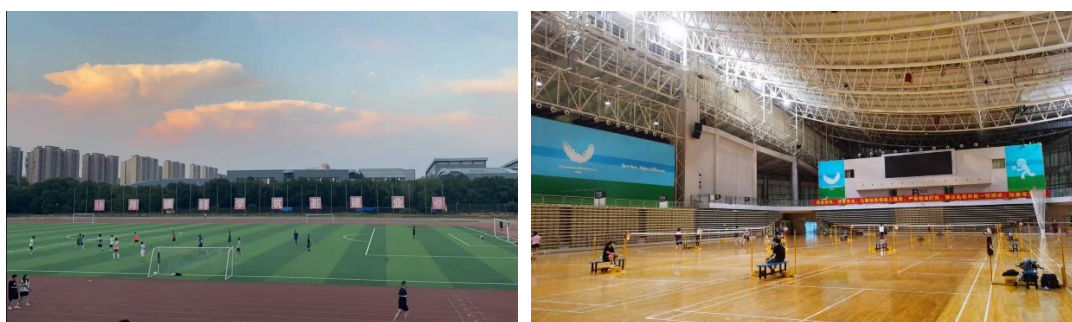


Figure 4. Outdoor playground of SJU (left) and indoor gymnasium of HITSZ(right). Source: Photographed by the author

It needs to be emphasized that a large enough campus area is not enough to alleviate the negative psychological emotions of students during the school closure. The size of a more private space (such as dormitory) has a more significant impact on students' mental health, which is shown that students in schools with smaller per capita dormitory areas are generally more likely to have negative emotions. For example, although HITSZ has a large campus and sufficient open space, it lacks private space and the per capita dormitory area is only about 3.75 m^2 /person, which is the lowest among the three schools, resulting in a high proportion of students having negative emotions. Although the campus area of SEU is only about 40 hectares, the space is rich in types and the per capita space in the dormitory is as high as 5 m^2 /person, which means students can have enough "small space" of their own to do things independently, so the impact on students' mental health during the school closure period is moderate. At the same time, both the campus public space and the private dormitory space of SJU are more complete and reasonable, with both publicity and privacy, which can meet the diverse needs of students, so the overall fluctuation of students' mental health is small.

4. Discussion

The planning and design of space has the characteristics of affecting people's physical and psychological activities. Therefore, campus planning has always had a subtle but non-negligible impact on the mental health of college students. School closures under the COVID-19 pandemic are just the catalyst for this effect to gradually emerge.

During the closure of the school, students' entire life can only be limited to the physical space of the campus and the services it provides, therefore both psychological and material needs put forward higher requirements for campus planning and design. Good campus planning can play the role of a "psychiatrist" to a certain extent. For example, the use of spacious and bright outdoor activity space can reduce the anxiety of students during the school closure, while poor campus planning can only aggravate a student's feeling of being "incarcerated". For example, the smaller the campus area, the more obvious the sense of restraint felt by the closed school students. The more people in each room of the dormitory, the smaller the independent and private space of students, which leads to an increase in the proportion of students with psychological problems.

Therefore, campus planning and design and students' mental health should become important topics in future disciplines. Planners should continue to provide spatial help for students' mental health, and at the same time strengthen reflection on existing campus planning and comprehensive consideration for future optimization. Here are two suggestions. The first is to call on all universities that may be affected by the COVID-19 epidemic to renovate the existing campus space combining the real needs of students and the suggestions of professional planners and psychologists, working together to make campus planning and design more humane.

The second suggestion is to add a "mental health-oriented campus planning topic" in the future campus planning, which including the planning of various activity venues and emotional relief spaces, the combination of sufficiently open public spaces and sufficiently private privacy spaces, etc.

5. Conclusions

Under the strict control of the COVID-19 epidemic, the impact of campus planning and design on students' mental health has gradually emerged. From the perspective of planning and design, this paper takes several comprehensive colleges and universities in China as research examples, after extensive questionnaire analysis and interviews, to study the relationship between the design of campus space and the psychological status of college students during the school closure period.

The main innovations of this research are as follows: (1) Starting from the perspective of space design, combining campus planning and people's mental health, to study the spatial influencing factors of college students' mental health problems during the school closure period, reflecting the people-oriented planning and space design. (2) Aiming at the real thoughts and needs of students, this paper put forward feasible suggestions for the optimization of future campus planning that is conducive to students' mental health.

The research has certain limitations. Firstly, the research sample is limited, and the results may be biased to a certain extent. Secondly, the control variables are insufficient when studying the factors affecting the mental health of college students, and it is difficult to separate out the influencing factors of space. In the future, we can conduct more detailed research on the impact mechanism of planning and design on people's mental health by controlling variables more strictly and expanding the scope of research.

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