Proceedings of the 4th International Conference on Educational Innovation and Philosophical Inquiries
DOI: 10.54254/2753-7048/15/20231056

The Relationship Between Living Density and Mental Health: Moderating Role of Internet Use

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Abstract: As the living area per capita decreases these days rapidly, high living density has resulted in mental health problems. Existing studies have shown that high living density will cause low mental health status, and college students also suffer from a high living density of school dormitories. However, researches on whether perceptions of the living environment affect college students' mental health and whether Internet use affects this relationship remains vacant. This study aims to explore the relationship between subjective and objective living density and college students' mental health and the moderating role of Internet use through a questionnaire survey. The questionnaire mainly collected three main pieces of information from the participants: living density, Internet use and mental health. Using descriptive statistics, correlation analysis and regression analysis, this study found a negative correlation between participants' perceptions of their living environment and stress levels. Different Internet usage times or feelings did not moderate such interaction. Therefore, attention should be paid to not only the subjective living density but also the objective perception of the living environment.

Keywords: living density, internet use, anxiety, stress

1. Introduction

As the global population grows continually at an unprecedented rate, the issue of living density has become a pressing concern. Over time, there has been a dramatic change in living density compared to the past, which can be reflected in the continuing decline in living space per capita. Such circumstance has resulted in numerous problems, particularly in the realm of mental health [1].

Research has shown that people have basic requirements for physical space [2] and that living in crowded and unfavorable urban environments can significantly impact people's mental health [1,3]. Those who reside in areas with high population density and poor living conditions tend to experience more negative sentiments compared to those who live in less crowded and more favorable environments [4]. This phenomenon is not limited to urban areas alone, as rural residents can be affected as well. Study has revealed that residential crowding in rural areas can also contribute to mental health problems, particularly in children [5].

In short, a poor-quality living environment characterized by high living density increases the likelihood of residents experiencing low mental health states [6]. Meanwhile, surveys have shown that a significant proportion of college students have psychological problems or are in a state of psychological sub-health [7]. Factors such as interpersonal relationships, electronic health literacy

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and college environments have been found to be related to these circumstances [8-10]. As research has established a significant association between living density and anxiety and stress among residents [11], it has to be considered as one of the factors affecting students' mental health. There is a study which shows that high living density in school dormitories is linked to anxiety and other mental disorders, such as Internet addiction [12]. Furthermore, it also shows that college students may have a tendency to deal with the problems caused by the high living density through Internet use [12].

As such, understanding the relationship between living density and mental health, particularly among college students, is a critical area of research. Though there is research that proves the characteristics of objective and the perceived built environments play different roles in mental health [13], similar consideration has not been applied in studies with college students. Besides, the improving functionality of Internet use is only a speculation and has not been proved confirmed by relaxant experiments. Therefore, this study will study the relationship between living density and college students' mental health from both objective and subjective aspects, and also explore the influence of Internet use on this relationship. The results of this study can make a contribution to a deeper understanding of the complex dynamics among living density, Internet use and mental health and provide valuable insights into how these factors interact and influence the mental well-being of college students in China.

The aim of this study is to explore the relationship between living density and mental health and the role of Internet use using a questionnaire survey conducted among students at a Chinese college. The questionnaire consists of three main sections, which are the living density, Internet use, and mental health of the survey subjects. This study will examine whether the perceived living environment affects the mental health and whether Internet use can improve the mental problems caused by living density.

2. Methods

2.1. Participants

A total of 115 students from Beijing Normal University participated in the survey, out of which 106 participants (13 males, 93 females) were included in the analysis as their responses were valid. The majority of the participants were undergraduate students (89.6%), while some were master's degree students (9.4%). Most of the participants resided in the school dormitory (94.3%), while others lived in off-campus rental accommodations (4.7%), and a few reported other types of accommodations (0.9%). In terms of living space per capita, more than half of the participants reported living in spaces less than 5 m^2 (65.1%), while about one-third reported living in spaces between 5 to 10 m^2 (30.2%), and a few reported living in spaces larger than 10 m^2 (4.7%).

2.2. Measurements

2.2.1. Living Space

Living space was assessed from two perspectives: subjective living space and objective living space. Objective living space refers to the living density of participants, which was measured by calculating the occupied area per capita within the dormitory for those who lived in the school dormitories or the total house area for those who lived in other kinds of accommodations. Participants were given three options to choose from: "less than 5 m^2", "5 to 10 m^2", or "more than 10 m^2.". Subjective living space refers to the participants' perception of their living environment. Participants were requested to score their perceptions of the living environment using a 5-point Likert scale, ranging from 1 "overcrowded" to 5 "spacious".

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2.2.2. Internet Use

Internet use was assessed from two aspects. One is the Internet usage time, which referred to the amount of objective Internet usage. The other is Internet usage feelings, which refers to subjective cyberspace awareness.

As smartphones are the primary devices for Chinese college students to access the Internet [14], the Internet usage time in this study refers to the daily duration of smartphone use. Participants were requested to provide the average hours of daily smartphone usage in the past month as a whole number.

The Internet usage feelings were measured using a series of self-designed questions mainly related to participants' sense of freedom and control while surfing the web. This series of questions consisted of 8 items (e.g., "I feel like I can have my own territory on the Internet."), which were scored on a five-point scale (e.g., 1 "never" to 5 "always"). The overall score used for data analysis was obtained by summing the item scores. A higher score indicated a higher level of cyberspace awareness. The scale showed good internal consistency, with Cronbach's $\alpha = 0.85$.

2.2.3. Mental Health

Anxiety and Stress were measured as the indicators of participants' mental health. The Self-Rating Anxiety Scale (SAS), designed by William in 1971, was used to evaluate the severity of anxiety among participants [15]. The SAS consisted of 20 items (e.g., "I feel more nervous and anxious than usual."), which were scored on a four-point scale (e.g., 1 "a little of the time" to 4 "most of the time"). The overall score used for data analysis was obtained by summing the item scores. A higher score on the SAS indicated a higher level of anxiety. The scale showed great internal consistency, with Cronbach's $\alpha = 0.92$. The Perceived Stress Scale (PSS), developed by Cohen et al. in 1983, was used to evaluate the level of stress that participants experienced [16]. The PSS consisted of 14 items (e.g., "How often have you been upset because of something that happened unexpectedly?"), which were scored on a five-point scale (e.g., 1 "never" to 4 "very often"). The overall score used for data analysis was obtained by summing the item scores. A higher score on the PSS indicated a higher level of stress. The scale showed great internal consistency, with Cronbach's $\alpha = 0.95$.

2.3. Procedure

The questionnaire was distributed, filled out and collected online. Participants were instructed to fill out the questionnaire due to their experiences in the entire previous month. Prior to filling the questionnaire, participants were given a brief explanation of the study's purpose and were guaranteed that their responses would be kept confidential. As compensation for their participation, all participants were provided with remuneration.

2.4. Data Analysis

The statistical software SPSS 20.0 was employed for data analysis in this study. Descriptive statistics, correlation analysis, and regression analysis were conducted to investigate the aims of this research in accordance with standard procedures for data analysis.

3. Results

3.1. Descriptive Statistics and Correlation Analysis

Descriptive statistics and the correlations among the main study variables are shown in the following Table 1. The majority of the participants were female. The majority of the participants were undergraduate students. Most of the participants had less than 5 m^2 of living space per capita. More

DOI: 10.54254/2753-7048/15/20231056

participants considered their living environment as narrow. The average daily smartphone usage time of the participants was 7.84 hours. Generally, participants had good cyberspace awareness and relatively low anxiety and stress levels.

The education level of participants had a significant positive correlation with both objective and subjective living space of participants and a significant negative correlation with the stress level of participants. These correlations can be explained by factors related to education level, as master's degree students typically have larger dormitories and better living conditions compared to undergraduate students. The objective living space of participants had a significant positive correlation with subjective living space of participants, which was consistent with the universal principle. The subjective living space of participants had a significant negative level on the stress level of participants. It indicated that regression analysis can be conducted between these variables. The anxiety level of participants had a significant positive correlation with the stress level of participants, which was consistent with the universal principle. Other variables did not show significant correlations with each other.

Table 1: Mean, SD and correlations of main variables.

	1	2	3	4	5	6	7	8
1 sex	-							
2 education level	-0.04	-						
3 objective living space	0.11	0.30**	-					
4 subjective living space	0.12	0.19*	0.73**	-				
5 Internet usage time	-0.08	-0.04	-0.03	-0.13	-			
6 cyberspace awareness	0.06	0.02	0.05	-0.11	0.02	-		
7 anxiety	-0.04	-0.19	-0.03	-0.10	0.03	0.07	-	
8 stress	0.06	-0.21*	-0.10	-0.20*	-0.05	-0.02	0.70**	-
M	1.88	1.11	1.40	2.33	7.84	3.18	1.61	1.82
SD	0.33	0.35	0.58	1.29	2.55	0.73	0.47	0.87

Notes: * $p < 0.05$, ** $p < 0.01$.

3.2. Regression of Living Density on Mental Health among College Students

Regression analysis of subjective and objective living space, Internet usage time and interactions on mental health are shown in the following Table 2.

Table 2: Regression analysis of subjective and objective living space, Internet usage time and interactions on mental health.

	Anxiety		Stress	
	Step 1	Step 2	Step 1	Step 2
objective living space	0.10	0.13	0.12	0.09
subjective living space	-0.17	-0.19	-0.30	-0.28
Internet usage time	0.01	0.00	-0.08	-0.08
objective living space × Internet usage time		-0.08		0.09

DOI: 10.54254/2753-7048/15/20231056

Table 2: (continued).

subjective living space × Internet usage time		-0.02		0.02
R^2	0.015	0.019	0.052	0.062
ΔR^2	0.015	0.004	0.052	0.009
ΔF	0.504	0.211	1.881	0.506

Regression analysis of subjective and objective living space, cyberspace awareness time and interactions on mental health are shown in the following Table 3.

Table 3: Regression analysis of subjective and objective living space, cyberspace awareness and interactions on mental health.

	Anxiety		Stress	
	Step 1	Step 2	Step 1	Step 2
objective living space	0.09	0.08	0.12	0.12
subjective living space	-0.16	-0.17	-0.30	-0.30
cyberspace awareness	0.05	0.06	-0.06	-0.05
objective living space × cyberspace awareness		0.19		0.12
subjective living space × cyberspace awareness		-0.26		-0.18
R^2	0.017	0.040	0.049	0.061
ΔR^2	0.017	0.023	0.049	0.012
ΔF	0.577	1.202	1.765	0.621

The interaction between subjective and objective living space and mental health was not moderated by different Internet usage times or by different cyberspace awareness.

4. Discussion

Previous studies have suggested a negative correlation between living density and residents' mental health, and the perceived living environment plays a role in residents' mental health [2-4,10,11,15]. Although the correlation between objective living space and mental health was not significant in this study, there was a negative correlation between subjective living space and mental health. Specifically, students who found their living environment unsatisfactory were more likely to suffer from high-stress levels. This suggests that the perceived living environment has an impact on residents' mental health, particularly their stress levels.

The difference between the results of this study and previous research on the influence of objective living environment on mental health may be the consequence of the relatively small sample size. Considering that only 106 responses were included in the analyses, and the standard deviations of participants' anxiety and stress levels were 0.47 and 0.87, respectively, it is possible that the differences between the data were not significant enough to yield consistent results. Furthermore, since environmental, social, cultural, psychological, and biological factors may affect females more than males [17, 18], the fact that the majority of participants in this study were female may have led to less variation in the results and contributed to the discrepancy with previous research.

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Studies have also suggested that social media use can affect mental health [19-21]. However, in this study, the interaction between living space and mental health was not moderated by different Internet usage times or different cyberspace awareness levels. Again, the relatively small sample size may be a factor here. For Internet usage time, the standard deviation was not small, indicating that participants may have gone online for reasons unrelated to their living environment and that daily smartphone usage time may not be able to reflect participants' overall Internet usage accurately. As for cyberspace awareness, the standard deviation was relatively small, potentially influencing data analyses. Additionally, the self-designed questions used to assess participants' feelings about the Internet world may not have fully captured their experiences. Although Cronbach's α was over 0.80, indicating good internal consistency, it was still lower than that of the SAS or the PSS in this research. In addition to the explanations described above, it is possible that Internet use cannot mitigate the mental health problems caused by high living density.

Given that this study found that students' perception of their living environment was related to their stress levels and that more than half of the participants were dissatisfied with their living environment, it is important for university administrators to address the issue of living density. Upgrading dormitory environments and expanding dormitory areas may be necessary to protect students' mental health.

It is worth highlighting that there were several limitations to this study, including a relatively small sample size and limited selection range in terms of sex. Furthermore, the majority of participants lived in either school dormitories or off-campus rental accommodations, resulting in essentially similar living conditions. These limitations contributed to minor differences in the collected data, potentially leading to inaccurate results.

5. Conclusion

This study revealed a negative correlation between residents' perception of their living environment and their stress levels. However, such correlation was not significantly moderated by both the Internet usage time and feelings. Conclusions can be drawn from the result that objective perceptions and feelings about the living environment are more influential to mental health than living density itself. Therefore, attention should be paid to residents' perceptions of the living environment rather than solely to living density in order to ensure their mental health.

This study contributed to the existing research by filling a gap in the study of the influence of residents' perceptions of their living environment on their mental health and revealing a factor that is related to college students' mental health. It also provided a reference for colleges to plan dormitory resources more rationally so as to improve students' overall mental health. Additionally, the study's findings may be useful in addressing mental health problems resulting from situations where activities have to be scaled down, such as home isolation during an epidemic outbreak.

The main limitations of this study included its small sample size and limited participant selection range. These limitations resulted in insufficient variation in the collected data, while similar living environments and habits among participants further amplified the drawbacks. To improve the study, the sample size should be increased, and participant selection should be expanded to include individuals who are not students and students from different universities. Additionally, the self-designed questionnaire questions should be improved to better assess participants' objective Internet usage feelings, increase reliability, and ensure participants understand the questionnaire's intended meaning.

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