Research Paper

The effect of subjective perception of the park environment on mental health among elderly people in cold region

a case study in Northeast China

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Abstract

Background: Urban parks have a positive impact on the mental health of the elderly, but there are few studies on the impact of the elderly's perceived environment on mental health, and the evidence is often uncertain. The climate in cold areas is harsh, the quality of the winter park environment is poor, and the elderly's life is more difficult. Their mental health needs to be taken seriously. Our goal is to use the survey data collected in Northeast China in 2022 to study the path and effect of the subjective perceived environment of parks in cold areas on mental health.
Methods: We distributed 180 questionnaires in Jilin City, Jilin Province, Northeast China, to collect the elderly's subjective perception of park environment and their mental health data. The mental health was measured by SRHMS scale and the structural equation model was established to evaluate the impact of the elderly's subjective perception of park environment on mental health in cold cities.
RESULTS: We analyzed the reliability of the survey data and concluded that Cronbach's α coefficient is greater than 0.7, indicating that the data are reliable and good. According to the results of the structural equation model, there is a significant correlation between the elderly's subjective perception of urban parks in cold areas and their mental health level.
Conclusion: Through analysis, we conclude that the elderly can positively affect the mental health of the elderly by the safety of activities in cold urban parks, the quality of the marking system and the familiarity of parks. However, the accessibility of cold urban park landscapes is negatively correlated with mental health. It may be that the elderly in cold urban parks are more inclined to choose open places in order to obtain a warmer environment and a better social environment.

Keywords

Subjective Perception of Park Environment, Mental Health, The Elderly, Cold Region

1. Introduction

At present, the aging of the population in our country is severe, and the elderly are increasingly concerned. The elderly generally have mild mental health problems such as loneliness and depression. The Outline of the "Healthy China 2030" Plan puts forward the goal of promoting residents' mental health literacy and strengthening interventions on psychological behaviors such as depression and anxiety. Studies have shown that participating in and experiencing activities in parks can improve the elderly's bad mood, promote interaction and communication, and improve the elderly's social relationships (Li and Zhang, 2009). Active physical fitness and social interaction activities in the environment of urban parks can reduce the risk of common diseases in the elderly, relieve the elderly's mental pressure, and promote the elderly's physical and mental health (Tan, He, et al., 2020). Therefore, exploring the relationship between urban parks and the elderly's mental health is an important prerequisite for optimizing the urban park environment, actively intervening in the elderly's health, and promoting the elderly's active aging.

Scholars have made certain achievements in the study of the improvement of the mental health of the elderly by the environment of urban parks. There are many factors that affect the mental health of the elderly in the environment of urban parks. Different factors play different roles, and the ways and paths of action are also different. According to experimental studies, some scholars have pointed out that outdoor activities provided by parks can keep people away from negative mental health incentives and improve mood. Urban parks can provide rich sensory experiences and have a positive impact on mental health (Belanger, Gallant, et al., 2019; Kim, Kim, et al., 2020; Tao, Yang, et al., 2020). Park environments can improve mood and reduce stress through individual contact with the natural landscape (Ulrich, Simons, et al., 1991; Chiesura, 2004).It can also improve the individual's experience by reducing noise and optimizing air quality (Dong, Wang, et al., 2021; Gidlof-Gunnarsson and Ohrstrom, 2007) and provide a place for crowd activities to support the needs of social interaction between people (Kaczynski and Henderson, 2007; Ekkel and de Vries, 2017).

In the study of healthy cities in cold regions, Leng summarized the international experience of climate planning for human settlements in cold regions, and proposed special planning guidelines at the urban design level according to the climate characteristics of winter, through the guidance of sunshine environment, bad wind environment, thermal environment, urban color and night landscape, etc., to improve the quality of human settlements in cold cities (Leng and Yuan, 2008). Jiang et al. proposed that wind speed is the leading factor affecting people's outdoor activities during the transition season through research on the comfort of public space in cold cities during the transition season (Jiang and Leng, 2017). Li studied the residents' winter health needs for public space, and proposed the establishment of a public space allocation system to increase the possibility of people participating in public space activities; optimize the layout of public space, improve the accessibility and pedestrian connection of public space; optimize the design of public space, and improve the comfort of residents participating in public activities from the aspects of space form, landscape, functional facilities and physical environment (Li et al, 2018).

In the study of the impact of urban park environment on the mental health of the elderly, scholars all believe that park environment is related to mental health. Some scholars point out that urban parks provide support for the mental health of the elderly in three aspects: natural environment, individual experience and activity facilities. In the study of healthy cities in cold areas, scholars have emphasized the built environment factors that prevent residents from being affected by climate conditions in cold areas and affect thermal comfort. At the same time, scholars have emphasized the walkability and safety of public spaces in winter.

Although different researchers have the same views on the promotion of urban park environment on the mental health of the elderly, there are relatively few studies on the impact of subjective perception of urban parks on the mental health of the elderly and the mental health of the elderly in cold regions. Therefore, on the basis of previous research, the author conducted field research on urban parks in cold cities Jilin City and issued questionnaires, proposed the impact path of urban parks in cold regions on the mental health of the elderly, and used SPSS and AMOS quantitative analysis to verify the path significance and impact degree of the hypothetical model through structural equation model, which provided a research basis for the planning and design of urban parks in cold regions.

2. Study Design

The main content of this study is the impact of the subjective perception of the park environment in cold areas on the mental health of the elderly. Considering the particularity of winter climate conditions in cold cities, this study selected the investigation site in Jilin City, Northeast China, and took three urban parks in Jilin City as examples. Firstly, we constructed a theoretical model and propose the model hypothesis H1: the subjective perception of the environment of urban parks directly affects the mental health of the elderly. Secondly, we obtained research data through field investigation. Finally, we verified and analyzed the impact path and effect of the subjective perception environment of urban parks on the mental health of the elderly based on the data.

2.1. Investigation area

The investigation areas of this study are Beishan Park, Jiangbin Park and Linjiangmen Park. The three parks are all located in the main urban area, with a long history and dense population nearby, so there are sufficient survey samples. The natural landscapes, facilities configuration and park experience of the three parks are distinct and different, which can better reflect the diversity of park environments, basically covering the types of common urban parks, and meeting the sampling needs of various factors involved in the study, as shown in Figure 1-3.

Figure 1. The real scene of Beishan Park. Source: Photographed by the author.



Figure 2. The real scene of Jiangbin Park. Source: Photographed by the author.



Figure 3. The real scene of Linjiangmen Park. Source: Photographed by the author.



2.2. Questionnaire design and survey

This study uses qualitative and subjective evaluation to measure variables, asking respondents to rate relevant descriptions according to their true thoughts. The evaluation method is evaluated by Likert's 7-level scale. "1" means strongly disagree, "2" means disagree, "3" means slightly disagree, "4" means generally, "5" more agree, "6" agree, and "7" means strongly agree.

In order to obtain a measurement scale with good reliability and validity, this study systematically searched and organized the research literature on the subjective perception characteristics of urban parks and the mental health status of the elderly. Combined with the existing general measurement scale, the relevant measurement indicators were determined as shown in Table 1.

Table 1. Measurement indicator table of urban parks.

Type of measurement indicator	Measurement indicators	Reference sources
Subjective perception of park environment	Sense of safety in parks	Sugiyama et al.
	Landscape accessibility of parks	Leng,H.,et al.
	Park activity support	Wang, X.Y and Yang, D.F.
	Familiarity of the park	Afroditi
Mental health status of the elderly	Satisfaction with Living Conditions of the Elderly	Xu Jun et al.
	Sense of safety in their living environment	
	Happiness of the Elderly	
	Loneliness of the elderly*	
	Older people's sense of identity in life	
	Older adults' comprehensive self-assessed mental health	

Note: * means reverse scoring is required

In January 2022, the author conducted a questionnaire survey on the elderly in three urban parks in Jilin City, and a total of 180 questionnaires were collected. A total of 145 questionnaires were selected from

the completed questionnaires and those over the age of 55 as valid questionnaires, which met the reference standard of the sample size required for structural equation modeling.

3. Results

3.1. Descriptive statistical analysis

We put the survey data into the SPSS 23.0 software for statistics, and found that in terms of social interaction frequency, the elderly generally go to the park for 5 to 7 days per week in winter, and the daily activity time in the park is 2 to 3 hours. In terms of the number of social activity partners, the elderly generally participate in social activities with 1 to 3 partners. In terms of types of social activities, most of the elderly participate in 2 to 3 sports, and a small number only take walks; in terms of activity enthusiasm, the proportion of the elderly with high enthusiasm (53%) is slightly more than that with low enthusiasm (37%); in terms of contact with friends, most of the elderly (63%) keep in touch with friends in the park by visiting each other, greeting by phone, etc.

From the elderly mental health self-evaluation data, we can see that most of the elderly participating in the survey are at a good level of mental health, the elderly have higher scores of life satisfaction and environmental security, and the elderly have lower average scores of loneliness and life identity.

Table 2. Self-rated mental health of the elderly (out of 7). Source: Drawn by the author.

Variable	Beishan Park	Jiangbin Park	Linjiangmen Park	Mean	Variance
Life Satisfaction	5.54	5.36	6.30	5.83	1.68
Sense of Environmental Safety	5.58	5.36	6.19	5.80	1.66
Happiness	5.65	5.15	5.83	5.61	1.92
Loneliness (reverse scoring)	4.90	4.61	5.81	5.23	3.72
Sense of life identity	4.75	4.55	5.92	5.22	3.62
Self-rated Mental Health	5.69	5.15	6.09	5.74	1.80
Total	32.11	30.18	36.14	——	——

3.2. Exploratory factor analysis

We put the survey data into the SPSS 23.0 software for statistics, and found that in terms of social interaction frequency, the elderly generally go to the park for 5 to 7 days per week in winter, and the daily activity time in the park is 2 to 3 hours. In terms of the number of social activity partners, the elderly generally participate in social activities with 1 to 3 partners. In terms of types of social activities, most of the elderly participate in 2 to 3 sports, and a small number only take walks; in terms of activity enthusiasm, the proportion of the elderly with high enthusiasm (53%) is slightly more than that with low enthusiasm (37%); in terms of contact with friends, most of the elderly (63%) keep in touch with friends in the park by visiting each other, greeting by phone, etc.

Table 3. Reliability Test and Validity Test. Source: Drawn by the author.

Reliability statistic		KMO and Bartlett's Test			
Cronbach's α	n	KMO	Approximate Chi-squared value	df	Sig.
0.861	10	0.910	1191.487	45	0.000

3.3. Model fit and path analysis

The AMOS 26.0 software uses the maximum likelihood estimation method to estimate the parameters of the SEM. After operation, we obtain the parameter estimates and normalized path coefficients of the model, as shown in Figure 4. At the same time, we extract important fitting indices from the model estimation data, such as Table 3: chi-squared/degree-of-freedom (χ2/df), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Root Mean Square Error of Approximation (RMSEA), comparative fitting index (CFI), Normed Fit Index (NFI) and Incremental Fit Index (IFI). Among them, χ2/df is 1.713, which is less than the critical value of 3.000, indicating that the model fits well; GFI, CFI and IFI are all greater than 0.900, and the model fits well. In summary, the SEM constructed in this study is relatively ideal.

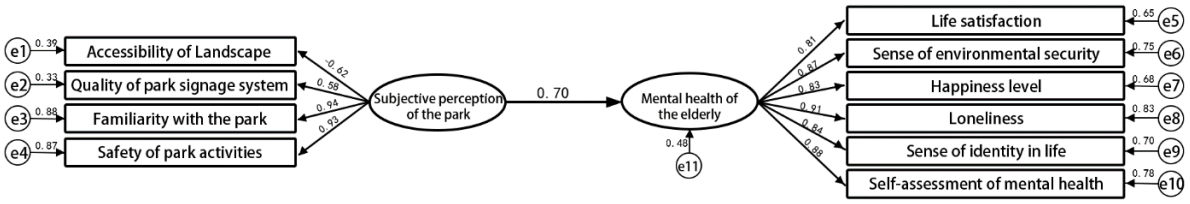

Figure 4. Path map of the influence of urban parks on the mental health of the elderly (estimated according to the standardization parameters of the model) .Source: Drawn by the author.

Table 4. Goodness-of-fit test of structural equation model. Source: Drawn by the author.

Fit Index	Reference Value	Model Prediction Value	Explanation
χ^2	——	42.835	——
df	——	25	——
χ^2/df	＜3	1.713	Less than 3 , indicating that the model fits well
GFI	＞0.90	0.947	Greater than 0.9, indicating that the model fits well
AGFI	＞0.90	0.884	Close to 0.9, indicating that the model fit is acceptable
RMSEA	＜0.08	0.070	Less than 0.08 , indicating that the model fits well
CFI	＞0.90	0.985	Greater than 0.9, indicating that the model fits well
NFI	＞0.90	0.966	Greater than 0.9, indicating that the model fits well
IFI	＞0.90	0.986	Greater than 0.9, indicating that the model fits well

The estimated values of the SEM path coefficients were calculated as shown in Table 5, where the estimated values of the normalized path coefficients reflect the relationship between each measurement variable and the degree of mutual influence of each measurement index. According to the P value, we can judge whether the path between the measured variables is significant. When $P < 0.001$, the path is significant at 99.9% confidence interval; when $P < 0.010$, the path is significant at 99% confidence interval; when $P < 0.050$, the path is significant at 95% confidence interval; when $P > 0.050$, the path is not significant. From the test results of the path coefficients, the assumption H1 was accepted.

Table 5. Results of path analysis between latent variables. Source: Drawn by the author.

Hypothesis	Path of measurement model	Estimation value of path coefficient	Standardized path coefficient estimation value	*P*	Conclusion
H1	Subjective perception of park environment—Mental Health	0.616	0.696	***	Accept

Notes: *** indicates significant at the 0.001 level.

4. Conclusion

4.1. Main findings

This study starts from the environment of urban parks in cold winter areas, pays attention to the mental health of the elderly, and intends to deeply study the relationship between the elderly's subjective perception and mental health status of urban parks in cold regions, and proposes the impact path of urban parks on the mental health of the elderly.

For the elderly, their subjective perception of urban parks in cold areas will have a positive impact on their mental health. The safety of park activities, the accessibility of the landscape, the quality of the park's sign system, and the familiarity with the park are the factors that affect the mental health of the elderly. Among them, the safety of park activities and the elderly's familiarity with the park are the main factors affecting the mental health of the elderly. It may be because compared with young people, the elderly are more fragile in physical state, more worried about physical and psychological damage, and have a higher demand for the safety of urban parks in cold areas. Therefore, the higher the safety of park activities, the higher the mental health level of the elderly. The elderly's familiarity with the park may be related to the elderly's sense of belonging. The more familiar the elderly are with the park, the stronger the sense of belonging, and the more it can affect the elderly's mental health. The accessibility of the park landscape has a negative impact on the mental health of residents, which may be because the accessibility of the landscape reflects the density of plants in the park. However, due to the cold climate, the park's winter landscape cannot provide enough green space for the elderly, and it takes up a lot of activity space in the park, reducing the scope of physical activity and social interaction of the elderly; in turn, it affects the mental health level of the elderly in reverse, and the elderly are more likely to choose to move in open areas with direct sunlight in winter. The quality of the park signage system has the least impact on the mental health of the elderly, and the park with better signage system can promote the mental health of the elderly.

4.2. Implications and limitations

This study provides new ideas for solving the health problems of the elderly in today's cold cities and exploring a healthy living environment: first, we should supplement the public facilities that are lacking in

most cold city parks to resist the severe winter climate; second, when planning the park environment, we should pay more attention to the refined design aimed at optimizing the elderly experience; finally, the subjective experience and satisfaction of the elderly in the city are crucial to public health. Before carrying out the senior-friendly design of urban parks, we should fully listen to the needs and opinions of the elderly.

However, this study also has certain limitations. First, we can only conduct a cross-sectional survey of the elderly's subjective perception and mental health, and lack of long-term tracking of the elderly's subjective perception and mental health. So the data may be affected by special events, resulting in inaccurate results. Second, the elderly's mental health data are self-reported according to questionnaires, and lack of auxiliary support for accurate instruments to measure their blood pressure, heart rate and other data. The influence mechanism of subjective perception of urban parks in cold regions on the elderly's mental health needs to be further explored.

Author Contributions

Conceptualization, Xueyan Ma. and Hong Leng.; formal analysis, Xueyan Ma.; funding acquisition, Hong Leng.; methodology, Xueyan Ma., Hong Leng., and Jingxin Qi.; validation, Xueyan Ma.. and Hong Leng.; writing—original draft, Xueyan Ma.; writing—revising and editing, Xueyan Ma. and Jingxin Qi.

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