

Building city gardens to promote public health

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Abstract

Urban residents are generally faced with increasingly prominent health problems. The root of the problem is that urbanization not only changes the local ecosystem, but also changes the living environment and way of life in which people and nature are increasingly separated. Green open space is an effective means to solve urban public health problems. The survey conclusion shows that urban residents are eager for open green space, and very expect to carry out aerobic exercise in open green spaces such as urban garden. The residents not only value the good ecological health physical environment of the urban gardens, but also value the five senses aesthetic experience of nourishing the mind and the spirit brought by the beauty of the landscape. The findings of the survey fully prove that the construction of urban gardens to promote the health of the whole residents is not only necessary but also feasible. Based on the empirical research results, the paper comprehensively demonstrates the dialectical relationship between the construction of urban gardens and the promotion of residents' health. Finally, from the perspectives of the selection of urban garden plants, the enhancement of aesthetic value, the improvement of the ecological environment, the implantation of the concept of health care, and the professional design and operation, etc. the paper puts forward feasible suggestions for building urban gardens to promote national health.

Keywords: city garden, public health, health problems

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1. Introduction

The topic of urban health and sustainability is a hot topic in domestic and international urban development and construction theories and practices, such as garden cities, ecological cities, mountain and water cities, livable cities, forest cities, sponge cities, and environmentally symbiotic cities. Domestic and foreign scholars attempt to define the connotations and evaluation criteria of various ideal cities and strive to differentiate their subtle differences in theory and practice. Comparing the research and practical results of these ideal cities at home and abroad, it is found that their essence all reflects the concept of "harmonious coexistence between human and nature", and their ultimate goal is to create a city where people can live in a good social and economic environment as well as a beautiful natural ecological environment.

The theory and vision of garden cities proposed by the British person E. Howard in 1898 laid the theoretical foundation for garden cities. The effective practices in Singapore over the past 50 years have pushed the construction of "garden cities" to a new height. Domestic and foreign cities such as Singapore, Geneva, Chicago, Bonn, Xiamen, and Hangzhou have achieved enormous economic, social, environmental, and ecological benefits through the creation of garden cities. The transformation of garden cities from ideals to reality is a product of the combination, infiltration, and mutual learning of world politics, economics, social sciences, and natural sciences, and it is a great accumulation of human spiritual civilization and material civilization. In recent years, in the theoretical research and practical construction of garden cities at home and abroad, in addition to increasingly high material environmental requirements regarding urban green space rate, green view rate, green functional layout and matching, ecological environment, cultural and artistic taste, three-dimensional space design, and local characteristics, there has also been a special focus on the beauty of the spiritual civilization of garden cities.

In the process of urban landscaping, garden landscapes are a crucial form of artistic expression. Many countries around the world attach great importance to city gardens as a goal of urban development (Zhang, 2018), especially those aiming for more sustainable, functional, livable, and attractive cities. City gardens are a creative solution to global environmental challenges and help establish closer ties between residents and their city, making it more appealing, healthier, and more sustainable (Tie, 2015).

The concept of city gardens is more advanced than that of garden cities. While garden cities are gardens incorporated into urban spaces, city gardens are cities situated within gardens. Following the enormous success of Singapore's garden city, the city has furthered its strategic development goals by establishing southern, eastern, and central parks as the main components of its urban gardens, covering a total area of approximately 101 hectares. Upon completion, the entire coastline will be linked as one continuous park (Yi, 2011). Singapore's urban gardens are positioned as a large-scale or macroscopic concept category.

Some scholars understand city gardens as urban gardens, emphasizing the incorporation of "using gardening and horticultural techniques and elements to integrate natural feelings into the urban context." (Wang, 2005). The creation of city gardens should consider various needs such as biodiversity, ecological environment, residents' health, and social interactions to attract residents to enjoy life, leisure, physical activity, relaxation, as well as social communication in these spaces. People can feel closer to nature when they are immersed in such environments. This research perspective and definition represent a medium or mesoscopic concept category of urban gardens.

Other scholars study city gardens at a smaller scale and propose that city gardens are an important spatial type of urban landscape architecture, which are biodiversity spaces that are based on the natural ecological environment and feature cultural and human characteristics as the main body, playing an important role in people's lives (Han & Wang, 2014). The urban gardens studied by these scholars are a small or microscopic

concept category and are closer to the concept of community gardens proposed by scholars in recent years.

The urban gardens studied in this paper are primarily located within the concept category of small-scale urban gardens and belong to the park green space category in urban green space classification. They are permanent gardens, similar to Singapore's Gardens by the Bay, Paris's Parc Floral de Paris, Spain's Jardines de la Granja, and other similar gardens. Because these types of urban gardens are closely related to the residents' daily lives and represent the form of landscape architecture that is most closely related to people among all types of urban green space. They reflect the residents' daily cultural life and have a significant impact on their behavior and lives. The construction of such gardens has a profound influence on residents' lives.

In urban gardens, people achieve various health goals by admiring plants, touching nature, smelling flowers, breathing beneficial gases, and engaging in healthy aerobic exercise. These goals include relaxation, anxiety reduction, stress relief, improved sleep, emotional adjustment, physical function restoration, chronic disease healing, improved children's social skills, and relief of ADHD symptoms, among others (Ai and Zheng, 2017). There have been fruitful research results and broad consensus on the promotion of human health benefits from community gardens, rehabilitation gardens, urban green spaces, urban forests, urban parks, and landscape plants both domestically and internationally. Western countries have always attached great importance to the health benefits of urban ecological spaces. Around 2010, scholars from countries such as the UK and Australia shifted their theoretical perspective to research on the relationship between community gardens and urban public health, promoting the research on health benefits of community gardens to a macro urban scale. Since then, there have been abundant research findings related to the health benefits of community gardens for residents (Lu et al. 2021). Research on the health benefits of urban ecological spaces has mainly focused on physiological and psychological aspects, as well as environmental conditions, human well-being, social equity, and the differential impact on different population groups. However, there has been a lack of attention and practical field investigations on the consumption demands of the urban garden enjoyment. Therefore, this paper conducts a categorized survey on the health demands of urban gardens for different population groups.

1.1 Objectives of the study

The paper aims to achieve the following goals through the research: to identify the health status and issues of different population groups in China and identify the gap between them and the health standards formulated by the World Health Organization; to discover the ways and behavioral preferences of daily health maintenance among different population groups in China; to reveal the expectations and specific health demands of Chinese residents for urban gardens.

2. Methodology

The paper primarily used a questionnaire survey method and distributed the survey through the online questionnaire platform "Wenjuanxing" among the urban population in major cities in China, with a total of 564 valid responses collected. The survey was categorized from the perspectives of age and occupation into four groups: students, working professionals, retired individuals, and other special groups. The survey focused on the health status, health maintenance habits, and health demands for urban gardens among these four groups and conducted statistical analysis based on the survey results. The "self-perceived stress level" and "self-perceived health level" ratings of survey respondents were ranked from 1 to 10, dividing into ten levels. The rating scale for "expectations for urban gardens" was divided into five levels ranging from 1 to 5, including "not expected," "less expected," "average," "expected," and "very expected." The ratings for "the ideal health characteristics of urban gardens for residents" were divided into five levels ranging from 1 to 5, including "not important," "less important," "average," "important," and "very important."

The reliability and validity tests, as well as the demographic distribution of the 564 survey questionnaire samples, can be found in tables 1-3.

Table 1*Reliability analysis of the survey questionnaire*

Cronbach reliability analysis		
Number of items	Sample size	Cronbach α
59	564	0.832

SPSS 23.0 was used as the data analysis tool to test the reliability of the questionnaire using Cronbach's Alpha coefficient, as shown in Table 1. The Cronbach's Alpha coefficient of the scale was 0.832, indicating high reliability and strong consistency and correlation among the items.

Table 2*Validity analysis of the survey questionnaire - KMO and Bartlett's test*

KMO value		0.861
	Approximate chi-square	17780.247
Bartlett's sphericity test	<i>df</i>	1711
	<i>p</i> value	0.000

By comprehensively analyzing the significance of KMO value and Bartlett's sphericity test, the validity of the questionnaire was examined. The KMO value was 0.861, and the significance of Bartlett's sphericity test was 0.000, indicating good validity of the questionnaire.

Table 3*Demographic Characteristics of the Survey Questionnaire*

Variable Name	Options	Frequency	Percentage (%)
Gender	Female	326	57.80
	Male	238	42.20
Age and Occupation	Students	198	35.11
	Working professionals	336	59.57
	Retired individuals	20	3.55
	Other special groups	10	1.77
Place of Residence	City	386	68.44
	Suburb	66	11.70
	Rural Area	112	19.86
Total		564	100.00

From Table 3, it can be seen that the distribution of gender, age, and occupation in the sample is basically reasonable. Because the focus is on analyzing the relationship between urban gardens and residents' health, more urban residents were selected for the study.

3. Results and discussion

3.1 Health Issues Among Different Groups in China

According to Table 4, the survey sample reflects that residents are under significant stress, with an average stress level of 6.6, which is on the higher end of moderate. Except for the retired and home-based population, all other groups are under considerable stress, with the highest stress levels found in disabled, pregnant, and other special groups, followed by working-class individuals. The perceived stress of students increases as their academic level rises. Among the working-class population, the perceived stress of those who start their own businesses or work in enterprises or public institutions tends to decrease.

Table 4*Perceived stress and health perception among different groups*

Self-perceived stress	Extremely low stress (1)	2-4	5-6	7-9	Extremely high stress (10)	Subtotal	Mean
Students	3.03%	8.08%	39.39%	37.37%	12.12%	198	6.49
Working professionals	2.38%	10.71%	28.57%	44.64%	13.69%	336	6.76
Retired individuals	20.00%	50.00%	10.00%	20.00%	0.00%	20	4.00
Other special groups	0.00%	0.00%	20.00%	40.00%	40.00%	10	8.60
Total						564	6.60
Self-perceived health	Very unhealthy (1)	2-4	5-6	7-9	Very healthy (10)	Subtotal	Mean
Students	4.04%	7.07%	29.29%	47.47%	12.12%	198	6.81
Working professionals	1.19%	10.12%	33.33%	45.83%	9.52%	336	6.78
Retired individuals	0.00%	0.00%	40.00%	50.00%	10.00%	20	7.10
Other special groups	40.00%	0.00%	20.00%	40.00%	0.00%	10	5.00
Total						564	6.77

Residents are not very optimistic about their own health status, with about 87% of the total surveyed sample having one health problem or another, although the mean is 6.77. The common health problems faced by residents are sleep and lumbar/cervical spine problems. In addition, students, and retired people both face vision problems, while the working-class and student population both face obesity problems, as shown in Table 5.

Table 5*Cross-tabulation of prominent health problems among different groups*

Populations	Top three health problems
Students	1-Sleep problems (43.43%) 2-Vision problems(39.39%) 3-Obesity problems(30.30%)
Working professionals	1-Lumbar/cervical spine problems (47.62%) 2-Sleep problems(35.12%) 3-Obesity problems(33.33%)
Retired individuals	1-Lumbar/cervical spine problems (50.00%) 2-Vision problems(50.00%) 3-Oral health problems(50.00%)
Other special groups	1-Lumbar/cervical spine problems(80.00%) 2-Endocrine imbalance problems(60.00%) 3-Sleep problems(40.00%)

Health is multidimensional, and scholars have a wide consensus on the three-dimensional model of health, which includes psychological, physical, and social dimensions (Yang, 2004). The concept of health may seem simple but is actually very complex. Among the 10 health markers proposed by the World Health Organization, the more explicit ones include good sleep, appropriate body weight, bright and non-inflamed eyes, clean and pain-free teeth, and optimistic and calm coping with daily work and life. This study found that the prominent and common health problems among the residents surveyed include sleep, lumbar/cervical spine, vision, oral health, obesity, and excessive stress, covering various aspects of the three-dimensional model of health. This situation differs greatly from the 10 health markers proposed by the World Health Organization.

The root cause of these health problems is the side effects of urbanization. Urbanization not only changes the local ecological system but also constantly alters people's living environment and lifestyle that are increasingly detached from nature: high-rise buildings, concrete jungles, fragmented green landscapes, polluted air, crowded work and activity spaces, ubiquitous noise, monotonous gray-white colors, extreme weather that continually breaks historical records, and an increasingly sedentary and enclosed way of life. The urban ecological system and residents' health are trapped in a vicious cycle.

In the face of various health problems, the only way is to first solve the ecological health problems. The relationship between ecological health and human health is a chain relationship between "social development-ecological health-human health", which can also be understood as the relationship between ecology, environment, and human health (Zhang & Bian, 2015). Currently, many studies have proven that urban gardens and green spaces have a significant effect on promoting residents' health. According to the research results of the theory of "restorative environment", urban gardens and green spaces have a significant effect on improving common physiological and psychological health problems such as sleep disorders, chronic diseases, obesity, eye diseases, and excessive stress (Hang, 2019).

3.2 Health and wellness maintenance methods for different groups in China

Whether in the usual or the ideal way, the proportion of residents who choose "outdoor exercise" to promote personal health is much higher than those who choose indoor exercise or medical care. About 58% of the population prefers outdoor exercise to promote health, and about 77% of the population idealizes outdoor exercise as a way to promote personal health. From the perspectives of age and occupation, all groups tend to choose outdoor exercise to promote personal health.

This paper further investigates and analyzes the preferred location for outdoor exercise among different groups. The results show that residents generally prefer outdoor exercise venues such as "nearby parks, gardens, and botanical gardens", and females have a much higher preference for this type of outdoor exercise venue than males (63.16% vs. 33.96%).

Table 6

Statistics and comparisons of the ways and venues for promoting personal health among different groups

Group/Population	Most commonly used method for promoting health	Most ideal method for promoting health
Students	Outdoor exercise (51.52%)	Outdoor exercise (65.66%)
Working professionals	Outdoor exercise (61.90%)	Outdoor exercise (84.52%)
Retired individuals	Outdoor exercise (60.00%)	Outdoor exercise (80.00%)
Other special groups	Outdoor exercise (40.00%)	Outdoor exercise (60.00%)
Total	Outdoor exercise (57.80%)	Outdoor exercise (77.30%)
Group/Population	Most frequently visited outdoor exercise venue	Most ideal outdoor exercise venue
Students	Nearby parks, gardens, botanical gardens (33.33%)	Nearby parks, gardens, botanical gardens (31.17%)
Working professionals	Nearby parks, gardens, botanical gardens (47.37%)	Nearby parks, gardens, botanical gardens (61.07%)
Retired individuals	Nearby parks, gardens, botanical gardens (60.00%)	Nearby parks, gardens, botanical gardens (33.33%)
Other special groups	Nearby parks, gardens, botanical gardens (100.00%)	Nearby parks, gardens, botanical gardens (50.00%)
Total	Nearby parks, gardens, botanical gardens (44.44%)	Nearby parks, gardens, botanical gardens (50.21%)

The research results in Table 6 have fully demonstrated the general preference and expectation of various groups for outdoor exercise venues such as urban parks, gardens, and botanical gardens. In order to further analyze how high residents' expectations are for the construction of urban gardens, this paper conducted targeted research on residents' expectations for the construction of urban gardens, as shown in Table 7 and Figure 1.

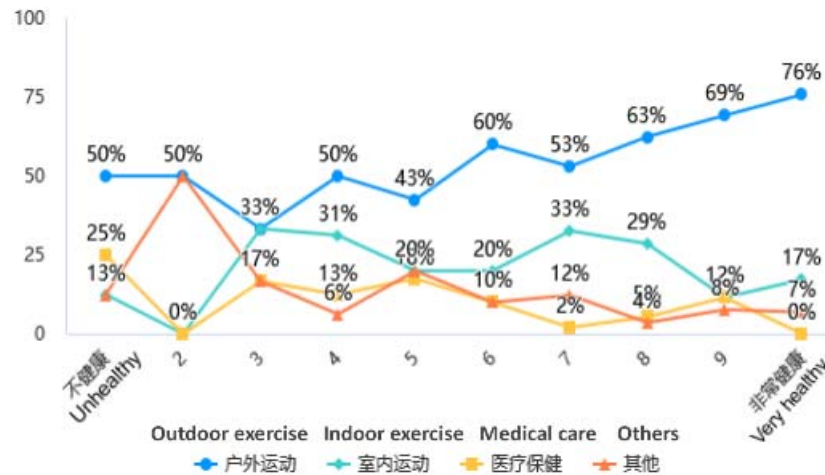


Figure 1: Line graph of expectations for urban gardens among different health issue groups

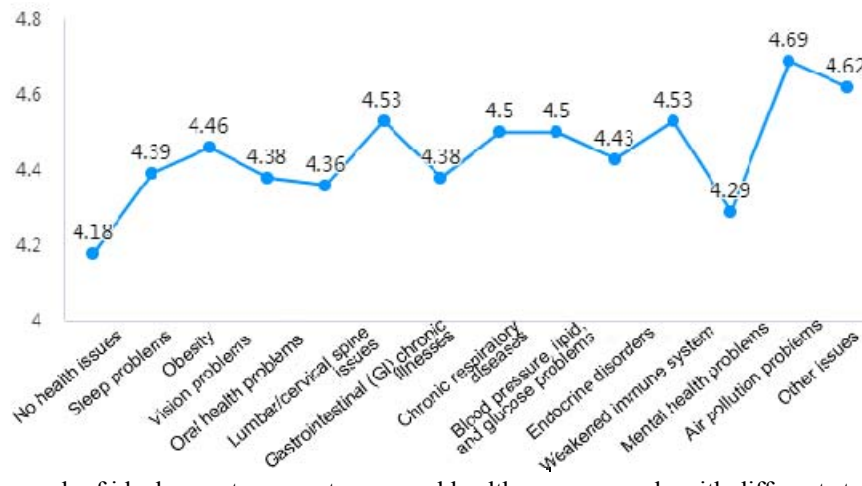


Figure 2: Line graph of ideal ways to promote personal health among people with different stress perceptions

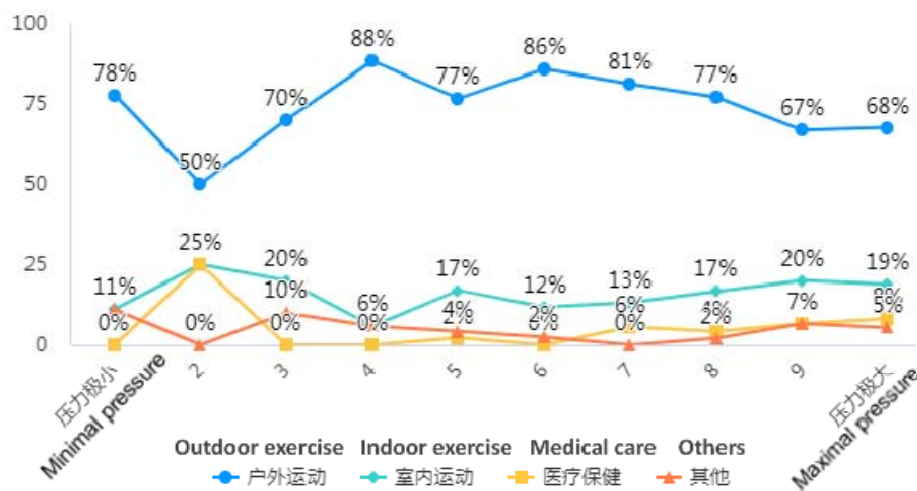


Figure 3: Line graph of ideal ways to promote personal health among people with different health perceptions

Table 7*Statistics on different groups' expectations for urban gardens*

Group/Population	Do not expect	Comparatively do not expect	Average	Expect	Highly expect	Mean	Subtotal
Students	3.09%	1.03%	22.68%	25.77%	47.42%	4.11	198
Working professionals	1.79%	1.19%	7.14%	16.67%	73.21%	4.58	336
Retired individuals	0.00%	0.00%	0.00%	30.00%	70.00%	4.70	20
Other special groups	0.00%	0.00%	20.00%	20.00%	60.00%	4.40	10
Total						4.42	564

The average expectation value for urban gardens among the survey sample is 4.42, which falls within the range of "expectation" according to the Likert 5-point scale, approaching the range of "highly expect". Regardless of whether residents have health issues or not, there is a widespread expectation for the construction of urban gardens near their place of residence. The group of people who are troubled by health issues such as "low immunity, air pollution, chronic respiratory diseases, blood pressure, blood lipids, blood sugar, chronic cardiovascular diseases, lumbar/cervical spine issues" have the highest expectation for urban gardens and belong to the level of "highly expect".

Figures 2 and 3 clearly show that regardless of the level of stress or health status, residents generally expect to promote their own health through outdoor exercise, and their preference for outdoor exercise far exceeds other health methods. People with a higher perception of their own health show a stronger preference for outdoor exercise. Comparing the two sets of data in Table 8, it can be seen that residents have a high degree of consistency in their demands for outdoor sports places and urban gardens, especially in terms of ecological environmental factors and health and wellness functions such as green vegetation and its shading effect, safety and accessibility, clean air, wide water bodies, microclimates that are beneficial to human health, blooming flowers, tranquil atmosphere and good biodiversity. Residents attach great importance to the natural ecological environment, safety, and close accessibility of urban gardens.

Table 8*Statistics on health characteristics of ideal outdoor sports venues vs. ideal urban garden*

Health characteristics of residents' ideal outdoor sports venues	Subtotal (number percentage)	
Lush greenery	187	66.31%
Clean air	173	61.35%
Expansive water bodies	151	53.50%
Blooming and colorful flowers	130	46.10%
Elegant floral, grass, and plant scents	126	44.68%
Easily accessible within a 5-minute walk	116	41.13%
24-hour security	110	39.01%
Plants emit beneficial volatile compounds for physical and mental health	103	36.52%
Professional fitness facilities	102	36.17%
A uniquely healthy microclimate	91	32.27%
Professionally designed infrastructure	90	31.91%
Like-minded fellow athletes	75	26.60%
Private space	67	23.76%
Scenic spots that are ideal for taking photos	63	22.34%
Lovely small animals	63	22.34%
Experiential activities and areas suitable for special groups such as children, the elderly, and persons with disabilities	60	21.28%
Various delicious fruits available	58	20.57%

Health characteristics of residents' ideal urban gardens	Mean importance level of this characteristic
Good ecological environment	4.52
24-hour security	4.48
Peaceful and quiet environment	4.40
Lush vegetation provides effective shade	4.36
Relatively high levels of negative ions in the air and other microclimates that are beneficial to human health	4.34
Good biodiversity	4.28
The park's planning and design reflect more professional wellness concepts	4.27
Plants release an abundant amount of beneficial volatile substances that promote physical and mental health	4.24
Effective fitness facilities and easy-to-understand fitness guides;	4.18
Plant barriers naturally divide private spaces	4.15
Experiential facilities for special groups such as children and pregnant women	4.15
Outdoor experiential activities with strong participation	4.12
Rich and pleasant sounds of nature	4.09
Changing scenery throughout the four seasons	4.08
Flowers bloom in all seasons and have a certain scale	4.07
Elegant fragrance fills all seasons	4.00
Professional fitness coaches provide professional guidance	3.87
Mean	4.21

Residents generally value the five-sense aesthetic experience of urban gardens, with a higher health need for visual, olfactory, and tactile than for taste and hearing. Of course, different groups have different health demands for urban gardens: students are more interested in flower sea photo-taking, interaction with small animals, tasting delicious food, private spaces, elegant floral and grass scents, plant scents, and other interests, while office workers focus more on good ecological environment composed of flowers, green plants, and clean air, and being within a 5-minute walk. Retirees and other special groups place more emphasis on having exclusive activity areas and health facilities, as well as flower sea photo-taking opportunities.

4. Conclusion and recommendation

The construction of urban gardens is closely related to public health, and its impact on public health is very important. Urban gardens effectively promote physical and mental health by providing outdoor activity spaces, improving air quality, promoting social interaction, increasing attention to the natural environment, and providing fresh ingredients.

Urban gardens provide healthy outdoor activity spaces for residents. Urban gardens provide people with a beautiful and peaceful outdoor space for leisure, exercise, and other forms of outdoor activities. These activities help promote physical and mental health. Urban gardens can effectively improve air quality. Trees and vegetation in urban gardens can absorb harmful substances and pollutants in the air, thereby improving the surrounding air quality. This can reduce the risk of respiratory and other health problems. Urban gardens promote social interaction among residents. Urban gardens are places where people gather, which helps promote social interaction and community cohesion. This is very important for improving people's mental health and sense of well-being.

Urban gardens provide residents with fresh ingredients. Urban gardens can be part of urban agriculture, growing vegetables, fruits, and other foods, providing local residents with fresh and healthy food. Urban gardens can alleviate residents' stress and anxiety. Urban gardens are a place for people to escape the hustle and bustle of the city, which can help people reduce stress and anxiety. This is very important for mental health. Urban gardens can promote physical activity among residents. Urban gardens can encourage people to engage in physical activities such as walking, running, cycling, etc., which is beneficial for preventing health problems such as chronic diseases and obesity.

Urban gardens can effectively improve sleep quality. Research shows that exposure to natural environments

can improve sleep quality. Urban gardens provide people with a natural environment, which can help them rest and recover better. Urban gardens increase residents' attention to the natural environment. Urban gardens can help people better understand and pay attention to the natural environment, which is very important for environmental protection and sustainable development.

For future research, it is recommended to focus on specific measures of how urban gardens promote residents' health. Research can be conducted from different perspectives, such as the functional configuration of urban garden plant landscapes, the improvement of urban garden ecological health environments, and the integration of urban garden health and wellness concepts. The goal is to explore how to promote public health through the construction of urban gardens.

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