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Urban Pedestrian Landscape Environment Design under the Guidance of Public Health

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Abstract: With the rapid development of population urbanization, urban landscape environment is increasingly concerned. Environmental quality not only reflects a city's cultural literacy, but also relates to the living conditions of urban people. In recent years, the concept of "low-carbon travel" has become popular. More and more urban residents pay attention to green development and take walking as the main form of activity. Green travel can not only improve the physical and mental health of residents, but also improve the quality of urban environment. Faced with the diversified development of modern cities, the public health awareness of residents is also being strengthened, which makes the urban landscape environment face unprecedented challenges. Therefore, how to design a healthy and comfortable urban pedestrian landscape environment is the focus of the current society. Therefore, this paper takes public health as the guidance, and conducts relevant experiments based on the demand of residents' healthy walking. The experimental data shows that when the walking distance exceeds 300m, the people's travel intention would begin to decline. In order to make the experimental results more sufficient, this paper also carried out a questionnaire survey. The survey results showed that 88.6% of the citizens agreed that walking was beneficial to their health, and 37.2% of the citizens believed that they should often walk out. Therefore, this paper aimed to promote the improvement of urban pedestrian landscape environment quality. The design scheme of urban pedestrian landscape environment based on public health guidance provides residents with a healthier and more comfortable lifestyle, and provides theoretical help for urban pedestrian landscape environment design.

1. Introduction

The public health of residents has always been a hot topic in residents' life. Nowadays, more and more people gather in cities, and the scale of cities is gradually expanding. The urban landscape environment affects all aspects of residents' lives, and the environmental quality also has an important impact on residents' health. A good and comfortable landscape environment is conducive to the healthy physical and mental development of the people, and is also crucial to building a civilized city and establishing a good reputation of the city [1]. Public health is the goal and

responsibility of urban development planning, which affects the material changes of urban landscape environment. In order to build a peaceful and comfortable urban pedestrian landscape and improve people's living environment, this paper explores the design and development needs of the current urban pedestrian landscape environment from the perspective of public health. This paper has carried out relevant experiments and investigations, and put forward a safe and effective design scheme, which provides inspiration for achieving public health and building a green walk.

The urban landscape environment is the spiritual outlook of a city and reflects the humanistic connotation of a city. Therefore, many scholars have expressed their research on it. Ginzarly Manal said that UNESCO has adopted the urban historical landscape proposal and called for the application of the landscape approach to ensure the achievement of the goal of sustainable urban development [2]. Alizadeh Behdad believed that urban landscape played an important role in supporting municipal, ecological and social systems [3]. Muderere Trymore believed that it was imperative to integrate cross group coupling data and urban landscape ecology research at different space-time scales [4]. Di Marino Mina believed that closer interdisciplinary cooperation between landscape architecture, species protection, water resource management and other disciplines would help to find new methods for urban landscape [5]. Neale Chris said that the range of environmental contrast between busy urban environments and other urban environments is an important factor affecting brain activity [6]. Mariano Carmela believed that due to the gradual rise of sea level, the urban environment is currently affected by floods in coastal areas [7]. Jones Karen R believed that behind the obviously nostalgic rural scenery of pre-industrialization, there was an irrefutable method of modern urban planning [8]. Krista Evans found that micro housing faces barriers to entering the city [9]. The development of cities has a long history, and the urban landscape environment would constantly change over time.

As an important part of urban landscape environment, pedestrian environment has attracted many scholars' research for a long time. Grant Gordon said that the idea that walking is beneficial to health is tacitly accepted, and there is more strong evidence to support this idea [10]. Panter Jenna found that few studies used control and comparison to explore the impact of environmental changes on walking [11]. Wang Feifei studied the effectiveness of walking on improving young people's sleep quality and promoting health [12]. Middleton Jennie discussed the sociality of daily urban walking, and said that when promoting walking as a form of low-carbon active travel, more consideration should be given to the experience of pedestrians [13]. Zhang Xiaohu found that the impact of building environment on promoting physical activity and improving public health has received more and more attention [14]. Fan Xi said that with the development of urban road construction in China, urban road landscape design is also making continuous progress [15]. As the existing urban pedestrian landscape environment is solidified, it can not meet the growing demand of people for walking. The research focus of this paper is to design urban pedestrian landscape environment based on public health guidance.

In order to reflect the guiding role of public health in urban pedestrian landscape design, this paper conducted a questionnaire survey. The survey results show that only 0.92% of residents are unwilling to walk for health, and the remaining 99.08% of residents say they should often walk for health. Among them, 61.88% of the citizens said that a good walking environment was the prerequisite for their willingness to walk frequently. This shows that the impact of environment on people's health should be based on people's health behaviors and needs, and optimize the design of urban pedestrian landscape environment, so as to reflect the role of public health in promoting and guiding the optimization of urban pedestrian landscape environment design.

2. Urban Pedestrian Landscape Environment

2.1. Urban Walking

Since human beings learned to walk upright, walking has become one of the most basic and daily ways of traveling. Walking is recognized as the best way to exercise because of its low carbon, environmental protection and safety. Walking plays a very important role in promoting people's physical and mental health, and building a walking environment also plays a number of important roles.

There are many functions of walking, which can be summarized as 10 points in this paper:

(1) Enhance heart function and prevent heart disease;

(2) Enhance blood vessel elasticity;

(3) Strengthen the body, move joints, increase muscle elasticity, and promote blood circulation;

(4) Improve appetite, promote gastrointestinal peristalsis, strengthen digestive function, and prevent constipation;

(5) Eliminate brain fatigue, improve efficiency and enhance memory;

(6) Relieve muscle and nerve tension, stabilize mood and delight spirit;

(7) Reduce blood pressure, reduce blood lipid accumulation, and relieve palpitations;

(8) Lose weight and shape;

(9) Prevent myocardial infarction and control adrenaline surge;

(10) Protect the environment, low-carbon environmental protection, enhance immunity and prolong life.

2.2. Urban Landscape Environment

The urban landscape environment refers to an environmental atmosphere formed by various streets, buildings, greening, etc. in the city, which is the image of a city. It can not only reflect the civilized connotation of a city, but also have an important impact on the quality of life of urban people [16].

The basic characteristics of urban landscape environment include three points:

(1) Composite characteristics

The urban landscape environment is a picture composed of hardware facilities and software activities in the city.

(2) Diachronic characteristics

The development of cities has a long history. Modern cities are gradually developed from rural areas and have their own experiences. Therefore, the urban landscape is diachronic. It is formed by the precipitation and transformation of a period of history. However, the urban landscape would not be fixed.

(3) Local characteristics

Due to the different historical experiences and geographical locations of each city, each city has its own characteristics and styles. In addition, the people in each city have different styles and living habits, which makes the urban landscape environment local.

2.3. Urban Pedestrian Landscape Environment Design

The urban landscape environment is related to the living standard of the people, and it is intuitively important for the residents' sense of well-being and health. It needs to constantly change the design of the urban pedestrian landscape environment. The design of urban pedestrian environment landscape is generally designed from two aspects: hardware and software. Hardware

refers to the road facilities in the urban pedestrian environment landscape, and software refers to the natural construction and green landscape. The society has entered the era of the Anthropocene, and mankind and its activities dominate almost all ecosystems on the earth [17]. Therefore, in terms of software, the aesthetics of urban environment, human environment and urban natural ecological environment should be considered.

The design principles of urban pedestrian landscape environment include four categories:

(1) Systematic principle

In fact, each system of a city is an organic whole. Elements of each system coexist and check and balance with each other, forming an organic system to promote the development of a city. Therefore, the design of urban pedestrian landscape environment should comply with the systematic principle of the city, starting from the overall city, coordinate the dynamic representation of the urban system, and lay the foundation for the sustainable development of the city [18]. Therefore, before starting the design of urban pedestrian landscape environment, it is necessary to determine the pedestrian space of this urban system, reasonably configure the pedestrian space and buildings around the pedestrian road, and achieve the harmony and unity of two-dimensional space and three-dimensional space.

(2) People oriented

A good urban pedestrian environment design should be guided by a clear goal to guide the progress of the entire environmental design. Environmental design is to create a more healthy and comfortable urban environment, bring better life experience to residents, and promote the harmonious development of the city and residents. Therefore, protecting the fundamental interests of the people is the original intention and purpose of environmental design. Then, when designing the environment, it should focus on the living needs and behavior habits of residents to create a more colorful walking space for the people.

(3) Principle of contextualism

Context refers to the cultural connotation of a city that comes down in one continuous line. The development of a city has its own cultural heritage from ancient times to the present. The design of urban pedestrian landscape should respect the humanistic history of the city itself. Under the existing humanistic conditions, the design of the pedestrian environment would lead to the loss of urban diversification if the historical culture of the city itself is ignored, which is not conducive to cultural and historical inheritance.

(4) Low carbon environmental protection principle

The earth is a place where human beings and nature live together. While developing, human beings cannot ignore the protection of the earth’s natural environment. For a city, the natural environment and artificial environment together form an urban ecosystem. Therefore, when designing the urban pedestrian landscape environment, it is necessary to consider the relationship between human and nature, maintain the harmonious development of human and nature, and practice the principle of low-carbon environmental protection from two perspectives [19]. First, the design of pedestrian landscape environment should adapt to the development direction of the city, reasonably allocate the natural environment, make full use of natural resources, and organically integrate the pedestrian environment with the natural environment. Second, the design should be based on local conditions, adapt to the geographical conditions of each city, and design according to its environmental characteristics.

When designing the urban landscape environment, the landscape capacity of the urban area is usually considered. The landscape capacity of a landscape environment is generally fixed. Therefore, calculating the landscape capacity before designing a piece of urban landscape environment can measure the landscape connotation and development prospect of the landscape environment. There are three methods for estimating landscape capacity: area estimation, route

estimation and ecological estimation [20].

(1) Area estimation method

The area estimation method is related to the area of the landscape environment. Generally speaking, the larger the area, the richer the landscape resources that can be constructed, and the more promising the landscape environment would be. Thus, the calculation formula of landscape capacity can be obtained [21]:

$$A = n / p \tag{1}$$

In the formula, n represents the area that can be visited in the landscape environment, p represents the area that can be visited by a single population, and the average per capita area is set as 5-10 ㎡/person, and then formula (2) is obtained:

$$n = N \times m\% \tag{2}$$

N refers to the total area of the landscape environment, and m refers to the proportion of the landscape environment that can be visited. Generally, the visiting proportion is 50-70%. The specific design should also be determined according to the situation of the urban landscape environment.

(2) Streaming line estimation method

The route estimation method is related to the road in the landscape environment. The characteristics of the road (such as stone road, cement road, brick road, etc.), the length of the road distance, and the width of the road would affect the route estimation method.

The formulas for calculating the landscape capacity with the streamline estimation method are:

$$B = L / p \tag{3}$$

$$L = x \bullet y \bullet z \tag{4}$$

x represents the characteristics of the road, y represents the length of the road, and z represents the width of the road.

(3) Ecological estimation method

The ecological estimation method is a method to estimate the landscape capacity in consideration of the ecological environment area. This method is affected by the ecological resources in the landscape environment. To maximize the landscape capacity without damaging the ecological resources, the calculation formula is as follows [22]:

$$C = n \times i \tag{5}$$

2.4. Public Health

The concept of public health has always been controversial in the society, believing that there are many definitions of public health. Some people think that public health refers to "science and technology for organized disease prevention and health protection of social groups". Some people think that its definition is "the sum of the ways to guide all people to improve scientific health". Others believe that "public health is a variety of organizational forms aimed at emphasizing all aspects of social health issues". There is also a recognized simple definition of public health, that is, public health. All issues affecting public health are public health issues.

3. Experiment and Analysis of Urban Pedestrian Landscape Design

3.1. Experimental Analysis of Urban Walking

So far, people do not have a fixed standard to measure the most appropriate walking distance. After all, people's travel would be affected by many factors. This paper selects 20 volunteers to carry out the travel experiment. By observing the number of volunteers reaching a travel distance of 1000m, it reflects the impact of travel distance on residents' choice of walking travel mode. Figure 1 shows the travel distance of 20 volunteers.

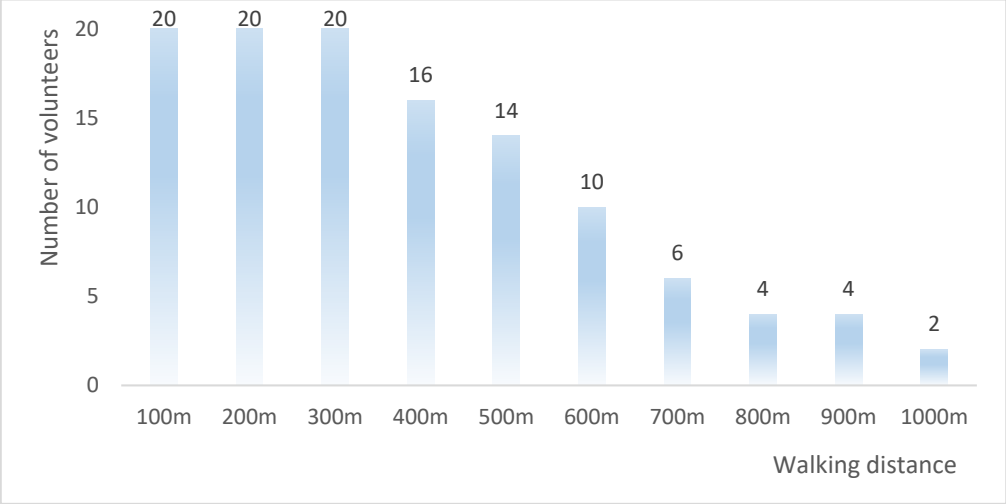

Figure 1: Walking distance results for 20 volunteers

From the travel distance data of 20 volunteers, it can be seen that when the walking distance exceeds 300m, the willingness of volunteers to travel starts to decline. When the travel distance reaches 600m, the number of volunteers to travel decreases by half, and only 10 people express their willingness to continue moving forward. With the increase of travel distance, the number of volunteers decreases gradually. When the travel distance is 800m, there are 4 volunteers left, and finally only 2 people have completed the goal of 1km. It can be seen that when the travel environment is controlled consistently, people's willingness to walk would be affected by the travel distance. The longer the distance is, the lower their willingness to walk. Travel distance is basically non variable, so if people's willingness to walk is to be increased, it can only be achieved by changing other objective factors, such as changing the urban pedestrian landscape environment.

3.2. Questionnaire

In order to truly reflect the impact of residents' urban landscape environment on walking, this paper conducted a questionnaire survey in a city. A total of 500 citizens participated in the survey, hoping to find out people's opinions on the urban walking landscape environment and people's views on urban walking through the survey, so as to make targeted improvements in environmental design and pave the way for the design of urban walking landscape environment from the perspective of public health.

(1) Questionnaire reliability

In order to ensure the authenticity and credibility of the questionnaire, 550 questionnaires were distributed and 520 were recovered, with a recovery rate of about 94.5%. 20 questionnaires with many missing questions were deleted. Finally, 500 valid questionnaires were counted. The questionnaire results were analyzed by SPSS software, and the clonal Bach coefficient α was

selected as the reliability coefficient. The questionnaire in this study is divided into two parts: the text questionnaire and the form questionnaire. As shown in Table 1, the clonal bach coefficients α of the text questionnaire and the form questionnaire are 0.871 and 0.883 respectively, indicating that the reliability of the questionnaire is good.

Table 1: Questionnaire reliability table

Reliability Statistics	
	Cronbach's Alpha
Text Questionnaire	0.871
Form Questionnaire	0.883

(2) Questionnaire result I

This survey explored the citizens' views on urban walking. Figure 2 shows the benefits of walking proposed by the public (multiple choices are allowed).

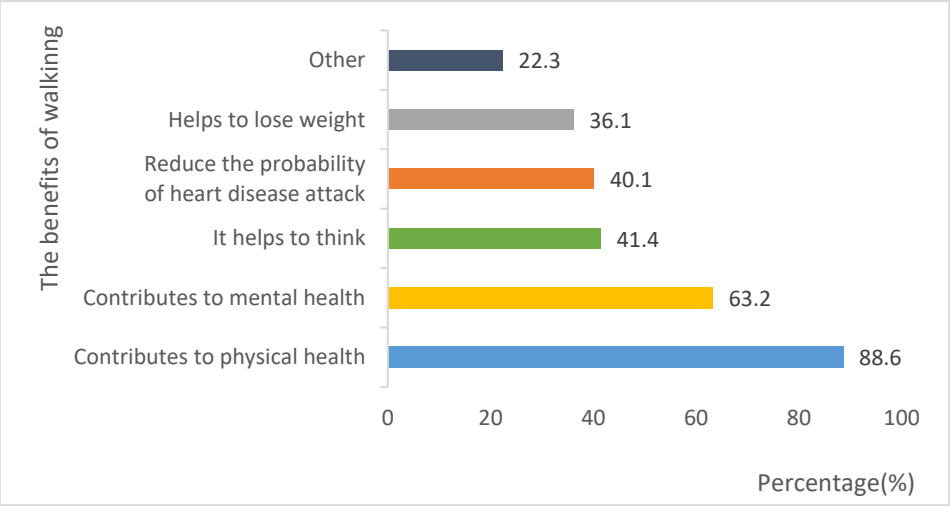

Figure 2: The advantages of walking considered by citizens

It can be seen from the data that 88.6% of the citizens agree that walking is beneficial to their physical health, and 63.2% of the citizens believe that walking is also beneficial to their mental health. 41.4% of the residents think walking is also conducive to thinking. 40.1% of the citizens believed that walking could prevent heart attack. Since walking is a relatively safe activity with a small amount of exercise, most people believe that walking has little effect on weight loss. Therefore, only 36.1% of the people think they can lose weight. It can be seen that the public still quite agree with the benefits of walking. Figure 3 shows the results of the survey on whether citizens should often walk out for health.

It can be seen from the survey results in Figure 3 that 37.2% of the citizens think they should walk out frequently, and 61.88% of the citizens express their willingness to go out frequently, provided that the walking environment is good. Only 0.92% of the people think that they should not go out on foot frequently, which fully shows that the vast majority of people pay more attention to healthy travel, and the walking landscape environment is an important factor affecting people's walking.

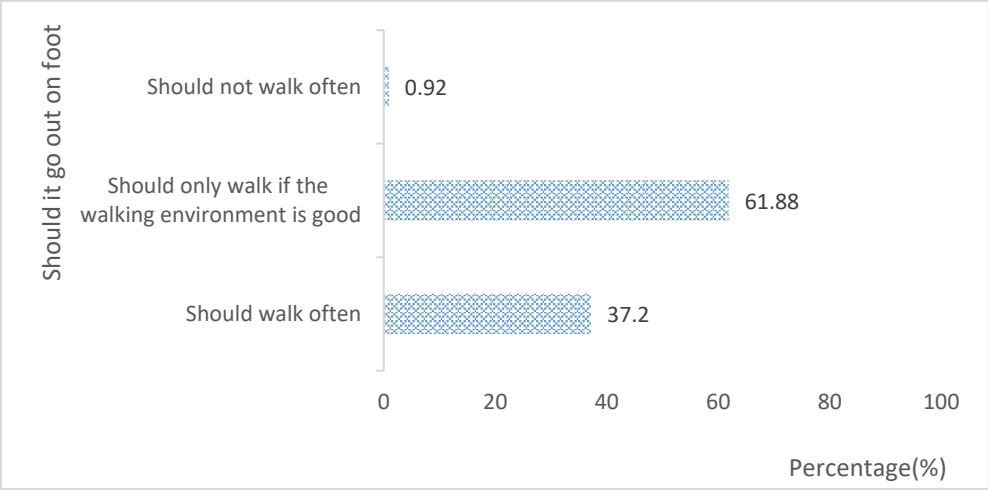

Figure 3: Survey results on whether citizens think they should go out on foot often

(3) Questionnaire result 2

The survey also found that many citizens believe that the existing urban pedestrian landscape environment has problems. In this paper, the problems mentioned by the citizens are summarized and sorted out, and the most popular problems are selected for statistics. The results are shown in Figure 4 (multiple choices are allowed).

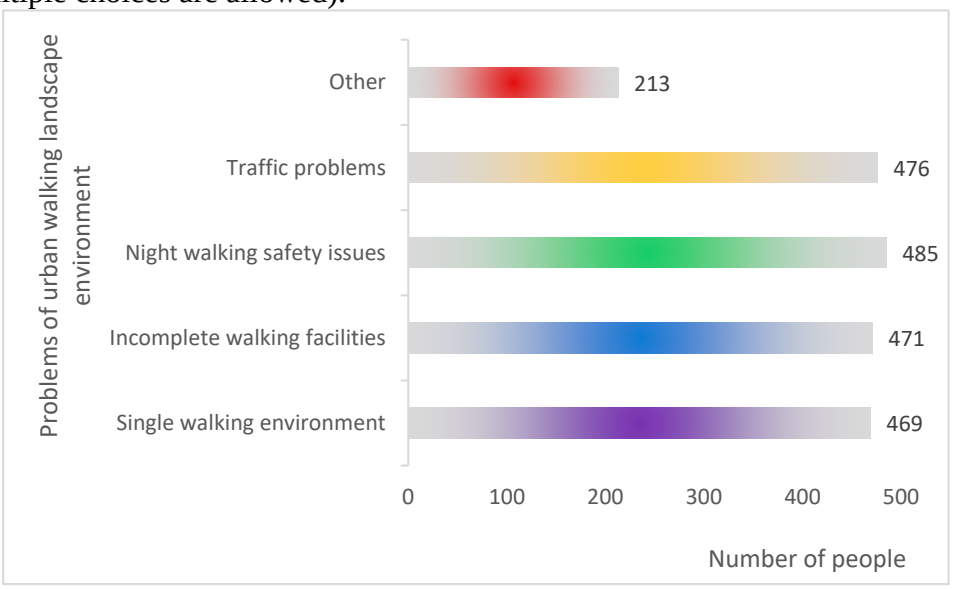

Figure 4: Survey results on environmental issues of urban walking landscape

According to the survey results, 469 people believe that the pedestrian landscape environment is single. 471 people think that the pedestrian facilities are not complete enough. The number of people who think that there are problems in walking safety at night is the largest, up to 485, accounting for 97% of the total survey population. Another 476 people believed that there were traffic problems in the pedestrian environment. Other questions raised by 213 people were not listed. This shows that the citizens think that there are still many problems in the urban pedestrian landscape environment. In order to improve these problems, this paper proposes a series of design schemes.

3.3. Urban Pedestrian Landscape Environment Design Scheme Based on Public Health

Based on the questions raised by the citizens in this questionnaire, this paper proposes a design scheme of urban pedestrian landscape environment from the perspective of public health.

(1) Single problem of improving walking environment

Generally, the urban pedestrian environment system refers to the pedestrian walkways on both sides of the road, streets and alleys, and some pedestrian walkways with open park landscape. Relatively speaking, the walking space is relatively small, and people's travel is more restricted. However, in a whole set of urban landscape environment, there are many beautiful and pleasant green spaces forgotten, such as some toll parks, closed private schools and the office environment of public institutions. These walking spaces can be encouraged to open to the public during non working days. This would provide a wider walking space for the urban pedestrian landscape environment and pave the way for creating an environment suitable for public health.

(2) Improve the problem of incomplete pedestrian facilities

The design of urban pedestrian landscape environment also needs to consider the travel habits, rules and health conditions of different groups. For example, for the elderly and children, safety signs, traffic lights, barrier free facilities and deceleration facilities should be added. At the same time, it is necessary to optimize the waiting distance and time for citizens to cross the street, reasonably arrange the duration of signal lights, and avoid too long red lights. Green light time is not enough to cross the street. The supporting facilities for walking can be improved, such as dustbins, seats, signs, etc., and a set of walking facilities can be configured every 400m to create a convenient and comfortable walking atmosphere.

(3) Improve night walking safety

According to the living conditions of residents, most residents only have enough time to walk out at night. Therefore, the safety problem of walking at night is the first important problem to be solved. It is not only necessary to add sufficient monitoring systems to the roads in the urban pedestrian environment system to ensure pedestrian safety, but also to provide good lighting conditions to maintain the visual experience of pedestrians when walking at night. At the same time, it is also necessary to fully consider the barrier free design in the design walking environment, whether the road slope is reasonable, whether the protective measures are in place, whether the road surface is anti-skid, whether the environment is clean and tidy and other issues need to be considered in the design scope.

(4) Improve pedestrian traffic

The traffic in the urban pedestrian landscape environment has always been a big problem that cannot be ignored. The unavoidable traffic noise can be improved by increasing the greening rate. The problem of mixed pedestrian and vehicle traffic needs to strengthen traffic control and set reasonable rules and regulations. For example, motor vehicles and non motor vehicles cannot walk humanely, pedestrians must follow the pedestrian route when walking, and pedestrian lanes with appropriate walking space need to be designed to avoid pedestrian congestion.

4. Conclusion

This paper discussed the status of urban pedestrian landscape environment design from the perspective of public health, and proved the guiding and positive role of public health in urban pedestrian landscape environment design through experimental data. It is of great significance to improve the environmental quality of urban pedestrian landscape, enrich the concept of green travel, improve the quality of urban life, promote the physical and mental health of residents, and promote the spirit of pleasure. Due to time constraints, the data of this experiment is not large, which may lead to some errors in the experimental results. Moreover, rectifying the walking resource

environment and configuring safety protection measures need to consume a lot of manpower and material resources, which requires high requirements for urban service facilities and cannot be effectively popularized. However, with the continuous progress and development of society, people's happiness index is rising, people's travel needs would be gradually met, and the solution to these problems would be soon. In order to better understand the impact of public health on urban pedestrian landscape design, the analysis results would be further improved from these perspectives in the subsequent research.

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