Article

Revealing Urban Public Space Patterns through Quantitative Comparison between the Old City of Nanjing and Zurich

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Abstract: Urban public space is indispensable in a metropolitan environment. In recent years, green space, as an important part of that public space, has been studied in terms of its pattern and equity of accessibility. However, the pattern of urban public space, including streets, has not yet been studied, nor has it been studied among different countries. To resolve this gap in information, this study conducted a quantitative comparison on the general pattern, type pattern, and scale pattern of urban public space between Zurich in Switzerland and the old city of Nanjing in China. This study also explored using the location quotient method to quantify the pattern of urban public space and its physical structure characteristics. The results show the difference between urban public space in China and Europe exists not only in quantity, scale or type, but also in the pattern of the urban public space system, including the choice of location, distribution status, and service level of that public space. The maximum location quotient of Zurich's public space is 9.5 for the areas located in the urban core area. Meanwhile, it is 8.5 for Nanjing for areas located in the periphery of the old city. Areas with a location quotient of greater than one cover 63.3% of the urban construction land in Zurich, while only 30.8% of the corresponding urban construction land is covered in Nanjing. The area and quantity of streets are quite different as well. The street areas of Zurich account for 51.5% of the total area of public space and the number of streets account for 51.2% of the total number of public space sites, while those numbers are only 22.6% and 17.5% for Nanjing, respectively. In addition, the scale gradient of public space is polarized. Both the area ratio and quantity ratio of medium, medium-large, and large public space in Zurich exceed 92%, while the area ratio and quantity ratio of Nanjing are less than 77% and 68%, respectively. This study provides important insights for revealing urban public space patterns to facilitate the sustainability development of urban public space.

Keywords: Zurich; old city of Nanjing; urban public space pattern; quantitative comparison; location quotient

1. Introduction

Urban public space refers to the openly accessible spaces available to the public for the daily life and social activities of urban residents, including urban squares, streets, parks, and other outdoor spaces [1]. Urban public space is indispensable in the metropolitan environment as it improves the quality of urban environment [2], maintains urban vitality [3], helps carry public life [4], and cultivates a public identity [5]. The study of public spaces first appeared in the fields of sociology and political philosophy in the 1950s, then was introduced into the subject of urban planning in the 1960s. This topic gradually became the subject of urban morphology and urban life research in the middle of the 1970s [6]. In addition, public space was always the most important carrier of public life in Western cities,

as represented by Europe. Usually, there is a clear boundary between public and private ownership in urban spaces, and buildings are closely related to streets, squares, and other public spaces so that the interchangeability between urban public space and buildings is often very strong. Many cities are even designed and built on the premise of shaping the public space [7]. Based on this profound tradition, the form of urban public space in Western cities is determined by the basic structure of urban public life and urban building. The importance of public space goes beyond the single building; the public space system is usually relatively complete.

Different from Western cities, the boundary between public and private ownership in traditional Chinese cities is relatively blurred [8]. The large public spaces that accommodate the life of citizens are scarce, and the urban public space is dominated by linear, introverted streets. In recent years, with the rapid development of society in China, the construction of urban public space has been significantly improved in quantity, quality, and publicity, which initially alleviated the shortage of urban areas for public activity in China for many years. In Shanghai, for example, the per capita public space increased more than 40 times from 0.18 m^2 [9] before the establishment of the People's Republic of China to 7.8 m^2 [10] in 2017. However, for a long time, the consciousness of public space in urban planning, construction, and research in China was still weak, focusing on the planning and construction of roads, squares, green space, and other infrastructure separately. Urban planning in China divides plots according to the relevant laws and regulations (Mainly included: Urban and Rural Planning Law of the People's Republic of China at the national level, the urban master plan and the urban regulatory plan at the local level) on the basis of which the corresponding indices such as green space, square, and parking are determined, with each plot being independent of each other.

Many researchers have studied the topic of public space from many dimensions, such as physical space [11–13], cognitive image [14], environmental behavior [15,16], social politics [17–19], and so on. These dimensions usually revolve around the specific space at the meso-micro level. The public attributes of public space have aroused much close attention. However, these studies do not involve the public space pattern at the macro level. For a city, the pattern problem has a great structural significance. However, how to carry out the study of urban public space pattern is a difficult problem. On one hand, it needs to abstract various specific spaces; on the other hand, it needs the support of corresponding technical means. The location theory of public facilities in the field of geography and the accessibility analysis technology based on the ArcGIS platform provide inspiration for this study. Teitz put forward the location theory in 1968; that is, to optimize the layout of urban public facilities by balancing the need for efficiency and equity, and construct a quantitative theoretical framework [20]. Since Teitz, the theory of public facilities turned to quantitative studies in the 1970s. Under the guidance of positivism research and based on behaviorism, quantitative methods, model construction and normative rationality, geographers interpret the efficiency and fairness of public goods distribution through distance, model, accessibility and externality in location analysis [21]. The paradigm of the location model has always revolved around the theme of balance between efficiency and equity [22,23]. The post-quantitative era went through the critical inheritance of the allocation of traditional public facilities under the background of humanism. Due to the support of GIS (geographic information system) technology, the complicated operation process has been greatly simplified, and accessibility analysis has been widely used in the layout studies of parks, shopping malls, medical, sports and educational facilities, etc. [21]. Lately, the types of public facilities were divided into facilities which are beneficial, harmful, or neutral. The accessibility equity of green space, as an important part of beneficial public facilities, has become a hot research topic [24–26]. Since Talen [27], the problem has focused on the physical distribution of green space—that is, how to measure, describe, and understand the geographical form of social justice or injustice; highlight the equality of the class, gender, and race of users [28,29]; and encourage a diverse mix of social groups and purposes [30]. In addition to the spatial dimension, some scholars lay more emphasis on the time process and regard the city as a dynamic continuing process. Mulíček and Osman discussed the ways in which the specific daily rhythms of the city are produced and structured [31].

The quantitative analysis of urban public spaces provide the following: the quantification of the public space form, mainly through morphological research methods, taking the specific city as an example to explore measurement methods of different urban spatial forms [32,33]; the quantification of the social function of public space, constructing the measurement method of the dynamics of people in the space by applying the principle of empirical mathematics [34]; the quantification of the behavioral characteristics of public space users, such as the behavior observation method [4], cognitive map method [14], activity node method [35] and so on, which are commonly used in the field of environmental behavior; the quantification of the green space layout, such as that of green space pattern, accessibility, and access equity based on GIS and other spatial analysis methods [23–25]; and exploration based on the big data platform, such as the analysis of the equity distribution of green space [36], park use, and its influencing factors [37]. However, the existing quantitative methods of urban public space cannot effectively quantify the general pattern of public space.

As reviewed, current spatial pattern studies mainly focus on green space; however, in addition to soft space such as green space, the hard space represented by the street (Roger Trancik divides public space into hard space and soft space. Hard space is mainly defined by buildings and is usually used as the main place for social activities, and soft space is mainly based on the natural environment and is used for relaxation.) is also an important part of urban public space [38], which all citizens should enjoy equally. Soft and hard public spaces should not be rigidly separated from each other because they are both organic components of the urban public space system. Second, based on the principle of difference equality established in Rawls' *A Theory of Justice* [39], the existing accessibility research introduces the social and economic dimensions related to users and pays attention to the expression of the interests of vulnerable groups and regions. However, this study will focus on the pattern of the physical space itself. As one of the factors that make up the eternal memory of a city, to some extent, the public space of a city is autonomous and self-reliable; it is a container for activities and a physical entity that can be observed and described. The public space is the starting and supporting force of sustainable cities, which has its own regularity and scientificity. Third, the existing literature usually examines the layout of green space in a city [23,24] or among different cities in a country [25], while this study focuses on the similarities and differences of urban public space patterns between developing countries (China) and developed countries (Switzerland) and explores the characteristics, problems, and potential of urban public space under different social backgrounds.

Through quantitative comparative studies on the pattern of urban public spaces in Zurich, Switzerland and the old city of Nanjing, China, this study will reveal the characteristics and differences in physical space by using digital formulation, and expand the quantitative analysis methods of the study on the pattern of urban public space. This study also proposes to establish relevant spatial analysis frameworks and techniques, aiming to deepen the understanding of the composition of the urban physical spatial form and to reveal the rule of the pattern of urban public space.

2. Methodology

2.1. Overview of This Study

The basic process of this study can be followed in Figure 1. A European city, Zurich, and a Chinese city, Nanjing, were selected as the typical cases in this study. Based on vectorized digital base maps, this study applied ArcMap attribute statistics combined with the location quotient method and spatial interpolation analysis to construct the contour and three-dimensional models of public space location quotients between Zurich and Nanjing. This study then obtained the specific rules and differences of the general pattern, type pattern, and scale pattern of the distribution of public space to explain and summarize the distribution level and concentration through the results. The following sections presents the details of methodology.
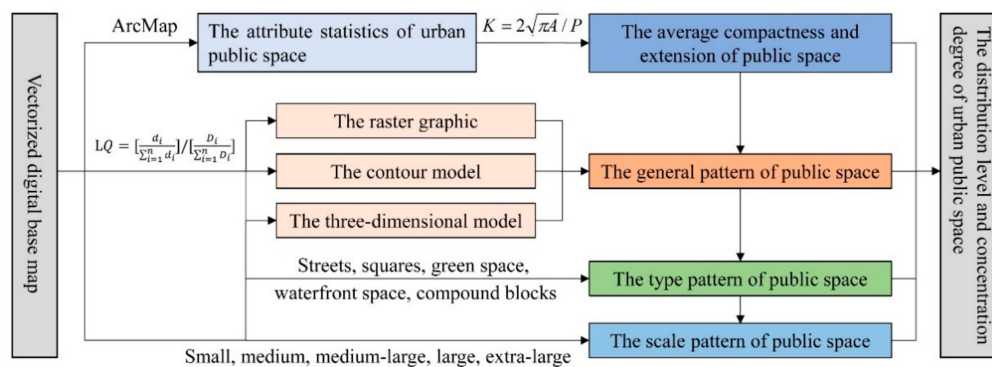
Figure 1. The overview of this study.

2.2. Quantifying the General Pattern of Urban Public Space

This study formed a vectorized digital base map combined with field investigation to cover layers of basic spatial data including urban public spaces, administrative divisions, and so on. The scope of public space in Zurich City was obtained on the basis of the current situation of public space, as determined in the Zurich Urban Space Strategy (Stadträume 2010) [40], by removing traffic nodes, expressways, main roads, tunnels, noise walls, parking lots, and other spaces unrelated to pedestrian traffic, and combining repeated field investigation, verification, and vectorized processing. Administrative district divisions were obtained by vectorization according to the district data from https://data.stadt-zuerich.ch. The scope of public space in the old city of Nanjing is relatively blurred, which has much to do with the long-time lack of understanding of the programmatic role of public space and the long-time lack of relevant planning. This study made a comprehensive reference to the *Short-term Planning of the Optimal Layout of Green Space in the old city of Nanjing*, the *Regulatory Plan of the Old City of Nanjing*, the *Urban Master Plan of Nanjing (2018– 2035), Urban Green Space System Planning of Nanjing (2013–2020),* and other related documents and drawings, combined with site surveys, investigations, and vectorized processing. Administrative district division comes from the *Regulatory Plan of the Old City of Nanjing*. Then, the GeoDatabase was established.

Such general layout data as total area, total quantity, average area, average perimeter, and proportion of public space in a city were obtained by using ArcMap attribute statistics.

Based on the compactness formula of urban form proposed by Batty [41]:

$$K = 2\sqrt{\pi A}/P \tag{1}$$

The compactness of urban public space was calculated. In Equation (1), K is spatial compactness, A is the spatial area, and p is the perimeter. The average compactness and extension of a city's public space was obtained.

2.3. Analyzing the General Pattern of Urban Public Space with the Location Quotient Method

2.3.1. Location Quotient Method

The location quotient method was introduced to describe the feature of the public space pattern. The location quotient (*LQ*) is also called the specialization rate, which was first proposed by the geographer Peter Haggett and used in regional analysis. The location quotient can be used to measure the comparison of the spatial distribution of a factor between a certain area and the average level to obtain the position and function of this factor in the high-level; the higher its value is, the higher the degree of aggregation of the factor is in the corresponding area.

The calculation formula of *LQ* is [42]:

$$LQ = \left[\frac{d_i}{\sum_{i=1}^{n} d_i}\right] / \left[\frac{D_i}{\sum_{i=1}^{n} D_i}\right] \tag{2}$$

In Equation (2), *LQ* is the location quotient of factor *i* in a certain area in contrast to the high-level area, which is used in this study to characterize the spatial distribution of the acreage share of urban public space in a certain area compared with the overall region; d_i is the index of factor *i* in a certain area; which in this study is the index of public space area; D_i is the corresponding index of factor *i* in the high-level area; and *n* is the category quantity of the factor.

As is easily inferred, *LQ* is a non-negative value. *LQ* > 1 shows that the position or function of factor *i* in an area exceeds the average level. This study applied the location quotient index in the field of geography in the urban field to construct a set of effective methods to quantify the pattern of urban public space and to express the results in a visualized manner.

2.3.2. The Analytical Steps of Location Quotient Method

The analytical steps that were applied to analyze the general pattern of urban public space using the location quotient method are as follows:

Step 1. According to the division of the minimum administrative district unit, the location quotient of the public space area of each administrative district unit of the specific city is calculated;

Step 2. The corresponding value of the location quotient is given to the centroid point of each administrative district unit, and the space interpolation is carried out by using the inverse distance weighted difference method to obtain a raster graphic with the *LQ* of public space as the gray value;

Step 3. A contour line extraction is carried out from the rasterized graphic to obtain a contour map of the *LQ* of public space;

Step 4. The three-dimensional height of the contour map is adjusted in ArcScene to generate the three-dimensional graphic.

The spatial statistical unit is set as the smallest administrative district unit since it can fully reflect the heterogeneous characteristics therein. In the structure analysis of public space, the smaller the analysis unit, the higher the accuracy would be, the more information can be provided, and the more valuable the information would be.

2.4. Quantifying the Type Pattern of Urban Public Space

The characteristics of the type pattern of public space are analyzed based on general pattern. The recognized types of urban public space mainly include streets, squares, green space and waterfront space. Their spatial scopes are further clarified in this study.

Streets: compared with roads, streets are usually enclosed and suitable for slow traffic; they tend to carry the compound function. The important basis for distinguishing streets from roads is the characteristics of traffic flow, the land use function on both sides, and the main service objects. The following cognitive characteristics of streets are determined in the study: First, streets are mainly distributed within urban functional districts, and are defined by the buildings on one side or on both sides, and the ratio of height to width of the cross section is generally not less than 0.5 (Sitte pointed out that 0.5 was the lower limit of the sense of spatial closure [8]), and the number of motor vehicle lanes shall not exceed 4. Second, walking and human activities play a dominant role. The average driving speed for motor vehicles should be below 30 km/h (according to the traffic calming theory, the interference of motor vehicle speed below 30 km/h to walkers is significantly lower [43]). Third, the degree of enclosure of the building interface along a street is more than 60% in order to help form a sense of spatial domain and increase the possibility of public life.

Squares: open spaces in a city surrounded by buildings, roads, or green belts; the presence of areas for particular outdoor activities; the scopes of which are usually easy to identify.

Green space: a piece of green land open to the public in a city, including the waters within its scope.

Waterfront space: public space in a city adjacent to rivers, lakes, seas, and other water bodies. Waterfront space is sometimes reflected in the form of a square or green space. This study stipulates that the public space in all waterfront areas belongs to waterfront space, and other non-waterfront public space is divided into square, green space, and other categories.

Compound block: street, square, green space, and waterfront space already cover the basic types of outdoor public space. However, the authors found out during their field surveys that some streets and squares are fused so well that it is difficult to distinguish them clearly, or streets and squares are organized together in a capillary-like way. There is also some special public space that is difficult to classify, such as the plus-in space under the urban viaduct. In these cases, the public space subsystem of the partial area is classified as a compound block.

2.5. Quantifying the Scale Pattern of Urban Public Space

Based on the general pattern, the characteristics of the scale pattern of public space are analyzed, and the proportion of the acreage of a single public space is one of the quantitative indices of the public space pattern. According to the empirical value and survey results, it is stipulated that the public space with an acreage of less than 1k m^2 is small public space, the public space with an acreage of 1-4k m^2 is medium public space, the public space with an acreage of 4-10k m^2 is medium-large public space, the public space with an area of 10-100k m^2 is large public space, and the public space with an acreage of greater than 100k m^2 is extra-large public space.

Finally, based on the explanation and synthetization of the above analysis results, the regularity understanding of the characteristics of urban public space pattern can be obtained.

3. Case Studies

Zurich in Switzerland and Nanjing in China were selected as case studies. China and Switzerland differ greatly in national conditions and political and economic systems. China has experienced a relatively short period of modernization, and its per capita GDP is only about 1/10 of Switzerland's, which directly affects the construction of public space. In Zurich, about 90% of the jobs are concentrated in the tertiary industry, and the contribution of service industry to the urban economy continues to rise. Zurich is therefore referred to as *the city of service supply* [44]. However, in 2017, the proportion of the triple industrial structure in Nanjing was 2.3:38.0:59.7 [45]. Although the proportion of service industry in Nanjing reached the largest level it had ever reached, it was quite different from Zurich's tertiary-industry-dominated structure. Therefore, this study chooses the old city of Nanjing with a higher service industry concentration and urbanization quality, instead of the whole city of Nanjing, as a comparison with Zurich City, which increases the comparability in the urban function composition.

In terms of the size of the city, Zurich has a city area of 91.94 km^2 and a population of about 403,000 in 2018 [46]. The old city of Nanjing covers an area of about 43.04 km^2, with a population of 1559,000 at the end of 2010 and Nanjing has a city area of 6597 km^2, with a population of 8.004 million in the same period [47]. The area of Nanjing city is larger than that of Zurich Canton, and the population of the old city of Nanjing has exceeded that of Zurich Canton (1.464 million in 2017). To make the data more comparable, the old city of Nanjing has been used to compare with Zurich.

With respect to land use intensity, although the old city of Nanjing is full of high-rise buildings, they are not compact enough. The average floor number of buildings in the public and residential domain is 4.2 and 4.6 respectively, only slightly higher than that of Zurich at 4.0 and 3.7 respectively [48], so they are also comparable.

Zurich City covers the whole area from the city center to the suburbs, while the old city of Nanjing is only the central area of Nanjing, which seems to weaken the comparability between the

two. However, Zurich expands to the outside along three main axes of development: northward to Winterthur, westward to Baden, and southward to Zug. These towns have convenient road and railway links with Zurich. Similar to Zurich, Nanjing City has also planned to build a model of "main urban area + three districts", that is, taking the main urban area as the core, forming an urban development axis leading to three new urban districts including Dongshan, Xianxi and Pukou (Figure 2). Both development ideas for the two cities intend to make full use of the main urban areas' radiation driving role by establishing a close relationship between the core and the satellite towns of the city, while a multi-center and open metropolitan spatial structure has come into being through the isolation of natural landscape barriers. Therefore, when we expand our vision to the metropolitan area, Zurich is the center of the Greater Zurich Area spread from Baden to Winterthur, just as the old city of Nanjing is the center of the Nanjing Metropolitan Area. The corresponding public space system becomes the system composition of the heartland of the metropolitan area.

To sum up, the public space pattern under the compact development mode of European cities has positive reference value for the construction of Chinese cities represented by Nanjing. In addition, the author N.X. has accumulated a certain amount of knowledge and experiences about the common characteristics of urban public space during her twenty years of living in Nanjing and one year studying in Zurich, which also affects the choice of the case.
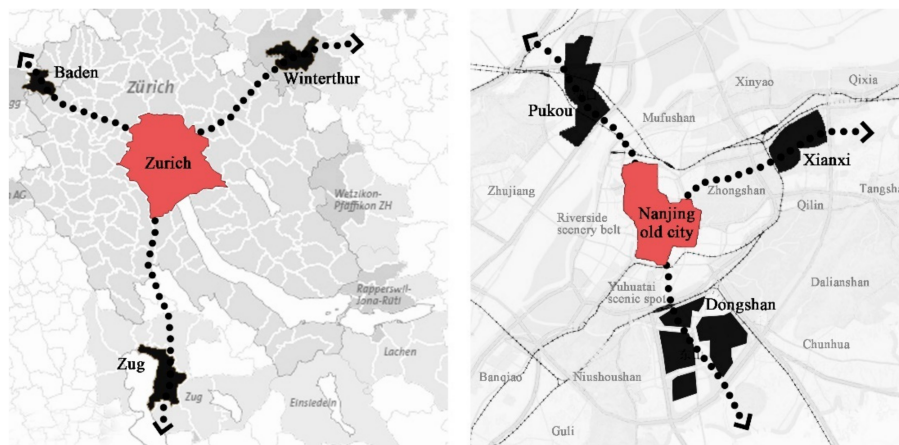

Figure 2. Zurich and Nanjing have similar urban development patterns.

3.1. Zurich City

Based on the boundary of its city area, Zurich administers 12 districts and the acreage is about 91.94km² (Figure 3a). Zurich's quality of life is recognized worldwide and has been repeatedly appraised as the best livable city in the world by Mercer, a major human resources consulting organization, in the years since 2000. Its excellent public space system is one of the most important factors as to why it is elected continuously.

3.2. The Old City of Nanjing

The old city of Nanjing is located in the area enclosed by the Ming city wall, including Gulou District, Xuanwu District, and Qinhuai District. The acreage is about 43.04 km² (Figure 3b). In recent years, the environmental quality of Nanjing has been greatly improved. The green space rate, greening coverage rate, and per capita public space area of Nanjing have ranked in the forefront among Chinese cities. Also, Nanjing has won the honorary titles of "National Hygiene City," "National Environmental Protection Model City," "National Garden City," and so on. In 2008, Nanjing was awarded the UN Habitat Scroll of Honor Special Citation [49].
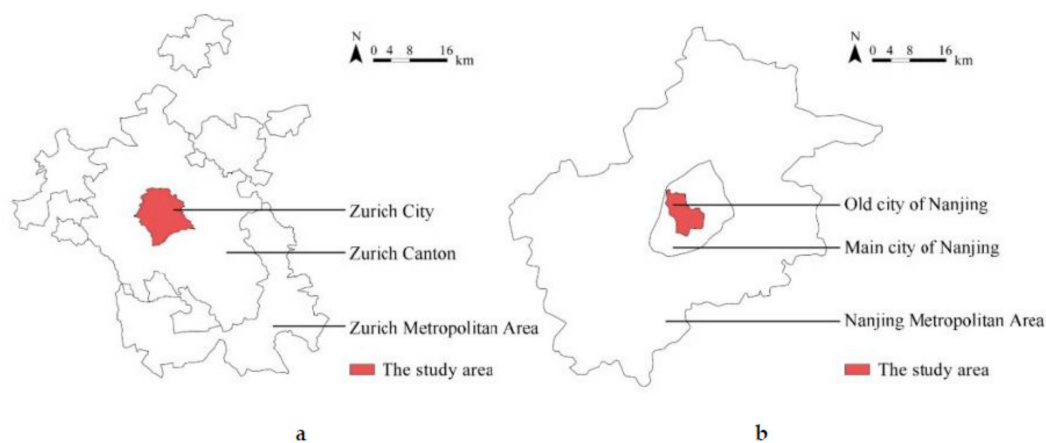
Figure 3. The study area of Zurich and the old city of Nanjing under the same scale: (**a**), Zurich; (**b**), The old city of Nanjing.

4. Results

4.1. The Quantitative Comparison Results of the General Pattern

4.1.1. Results of General Pattern of Urban Public Space

According to ArcMap attribute statistics, the study area of Zurich is 91.94 km^2, the area of urban construction land is 53.24 km^2, and the total area of public space is 5.77 km^2, accounting for 10.8% of urban construction land (Figure 4a). The study area of the old city of Nanjing is 52.20 km^2, the area of urban construction land is 43.04 km^2, and the total area of public space is 3.31 km^2, accounting for 7.7% of the urban construction land (Figure 4b) (The scope of urban construction land in Zurich is the area enclosed by the district boundary minus the area of urban non-construction land, including peripheral waters, forest land and country green space, while the urban construction land of the old city of Nanjing is the scope of the study area minus the area of the peripheral waters outside the city wall. The reason for limiting the comparison to urban construction land is that the area of urban non-construction land in Zurich is as high as 44.5% of its urban area.). There are 645 public space sites in Zurich, with an average area of 8947m^2 and an average perimeter of 865 m, while there are 337 public space sites in the old city of Nanjing with an average area of 9825 m^2 and an average perimeter of 782 m.

By comparing Zurich and the old city of Nanjing, we find that the difference of urban construction land area between them is not large, and the share of public space area in Zurich is 1.4 times as much as that in the old city of Nanjing. The total number of public space sites in Zurich is 1.9 times that in Nanjing. The average area of individual public space in the old city of Nanjing is larger than that in Zurich, while the average perimeter is smaller.

The average area and average perimeter data of public space for Zurich and the old city of Nanjing are brought into the formula (2) for substitution. As obtained by calculation, the *K* value of Zurich's public space is 0.388, and the *K* value of public space for the old city of Nanjing is 0.448. This shows that the average compactness and the extension of the outline of the individual public space in the old city of Nanjing are higher and lower respectively, while Zurich has the opposite characteristics (Table 1).
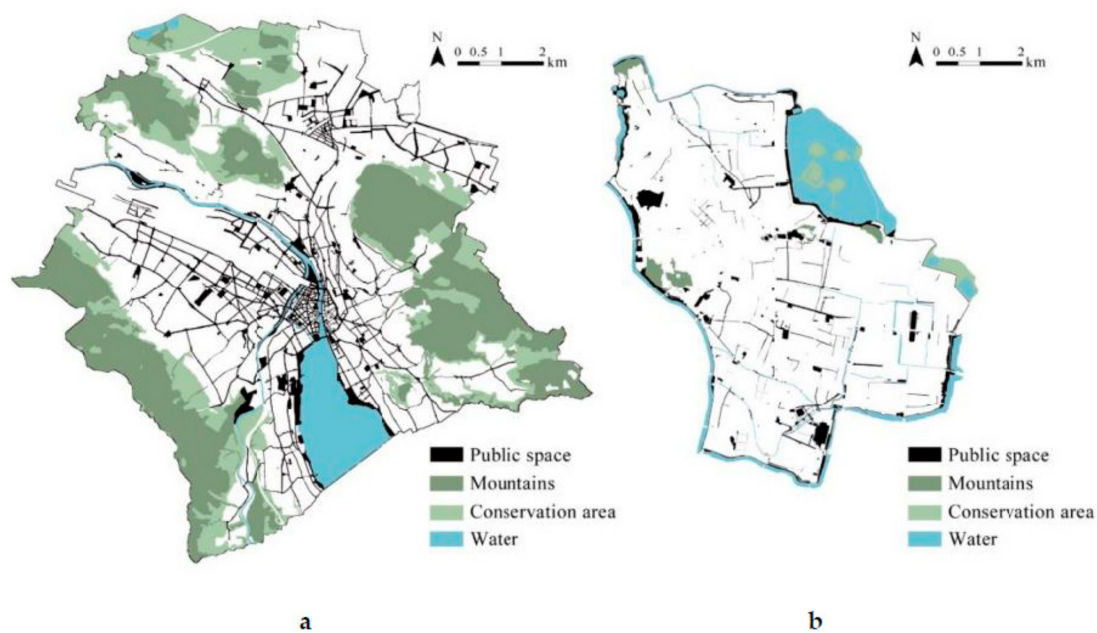
Figure 4. The pattern of public space of Zurich and the old city of Nanjing under the same scale: (**a**), Zurich; (**b**), The old city of Nanjing.

Table 1. Basic data of public space in Zurich and the old city of Nanjing.

	Total Area (km^2)	% of Total Area	Total Number	Average Area (m^2)	Average Perimeter (m)	K Value	Compactness	Extension
The public space of Zurich	5.77	10.8%	645	8947	865	0.388	Lower	Higher
The public space of the old city of Nanjing	3.31	7.7%	337	9825	782	0.448	Higher	Lower

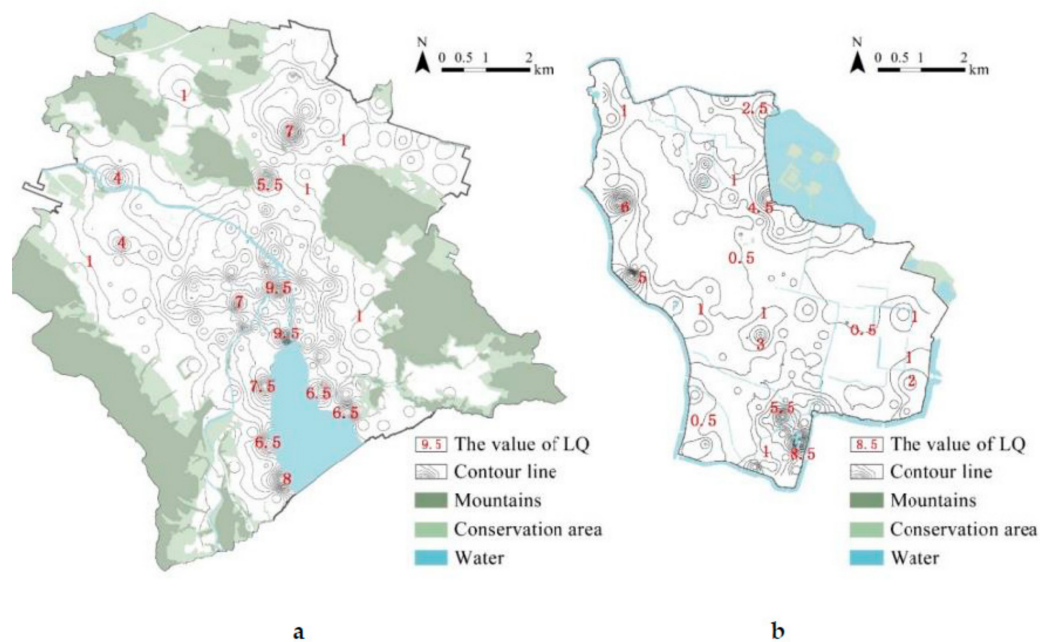### 4.1.2. Results of Location Quotient Method

Using the method described in Section 2.4, the contour map of the location quotient of the public space in Zurich and the old city of Nanjing is generated, as shown in Figure 5. The contour map is a graph in which the continuous distribution and gradually changing quantitative characteristics are represented by the lines of equal numerical points, so the location quotients of various points on a certain contour line are equal. Through the comparison, it can be found that there is a significant difference in the public space pattern between Zurich and the old city of Nanjing.

The maximum location quotient of public space in Zurich is 9.5, which is located in the core area of the city, and the high value area is also concentrated inside the city, mainly distributed in the old city of Zurich, the waterfront area of Zurich Lake and the city sub-center Oerlikon. Moreover, the location quotient of public space shows a decreasing trend from the center of the city to the periphery as a whole. This shows that the city center of Zurich has the largest number of public space sites, but the proportion of public space in the periphery of the city is relatively small, and the general pattern of public space shows an obvious trend of agglomeration toward the city center.

In contrast, for the old city of Nanjing, the maximum location quotient of public space is 8.5, which is located in the periphery of the old city, where the high-value area is scattered around said periphery, relying on several medium-large urban parks to form the peak value. Moreover, the location quotient of public space decreases from the periphery to the city center and forms a large area of low value in the city center. This reflects that the public space pattern of the old city of Nanjing is opposite to that of Zurich. A large number of public space sites are concentrated on the edge of the old city,

and the share of public space in the city center is less, forming the general pattern of public space dispersing to the surrounding areas of the city.


Figure 5. The contour map of location quotient of public space in Zurich and the old city of Nanjing. (**a**): Zurich; (**b**): The old city of Nanjing.

The three-dimensional map of location quotient of public space (Figure 6) reveals more intuitively the general pattern and the difference of public space between Zurich and the old city of Nanjing. The greater the location quotient of the public space, the higher the corresponding "peak" on the three-dimensional map. It was found through comparison that the high-value area of location quotient of Zurich public space is distributed continuously in the city center, forming a shape of fluctuating "mountains" which means that the main activity area of the city has abundant public space. However, the distribution of the high-value area of the location quotient of the public space in the old city of Nanjing is relatively scattered, and a number of isolated "peaks" come into being in the periphery of the old city. The public space is mainly distributed on the edge of the old city and the public space in the central area is relatively scarce.
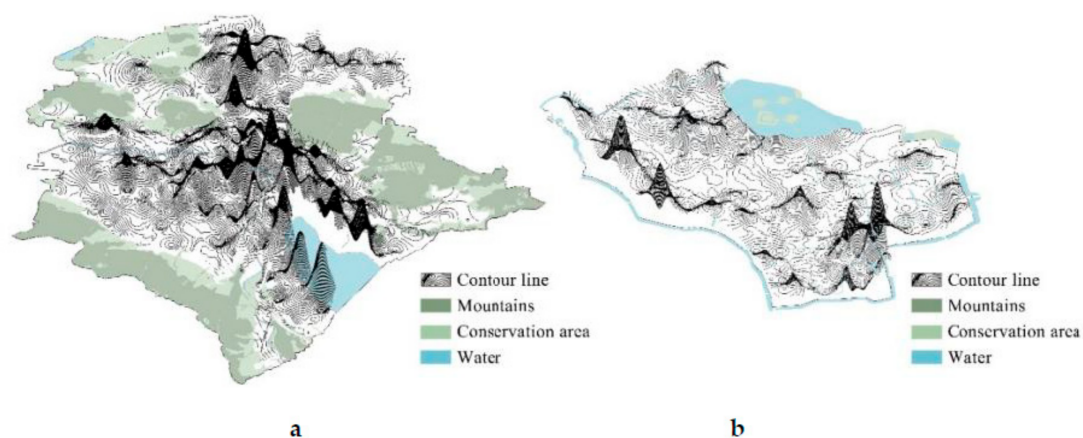
Figure 6. The three-dimensional map of location quotient of public space in Zurich and the old city of Nanjing: (**a**), Zurich; (**b**), The old city of Nanjing.

The position of public space in the two cities was further compared (Figure 7). The area where the location quotient of Zurich's public space is greater than one covers the main urban construction land, accounting for 63.3% of the total urban construction land. This shows that the role of public space in these areas exceeds the urban average level. While the proportion of land with the public space location quotient of greater than one in the old city of Nanjing is small, it accounts for only 30.8% of the total construction land in the old city of Nanjing, which is basically scattered in the periphery of the city. The role level of public space in most of the urban area is below average. By observing Figure 7, we can also see that the areas with a public space location quotient of greater than one in Zurich are basically connected and are strongly continuous, which indicates that the continuity of public space taking the dominant position in the urban area is strong. It can not only help to shape the urban public space, but also brings a relatively uniform general pattern of public space to the city. The areas where the location quotient of public space is more than one in the old city of Nanjing are relatively discontinuous, and the high-proportion of public space is divided into several blocks. The proportion of public space in most urban built-up areas is low, and the uniformity is not good enough.
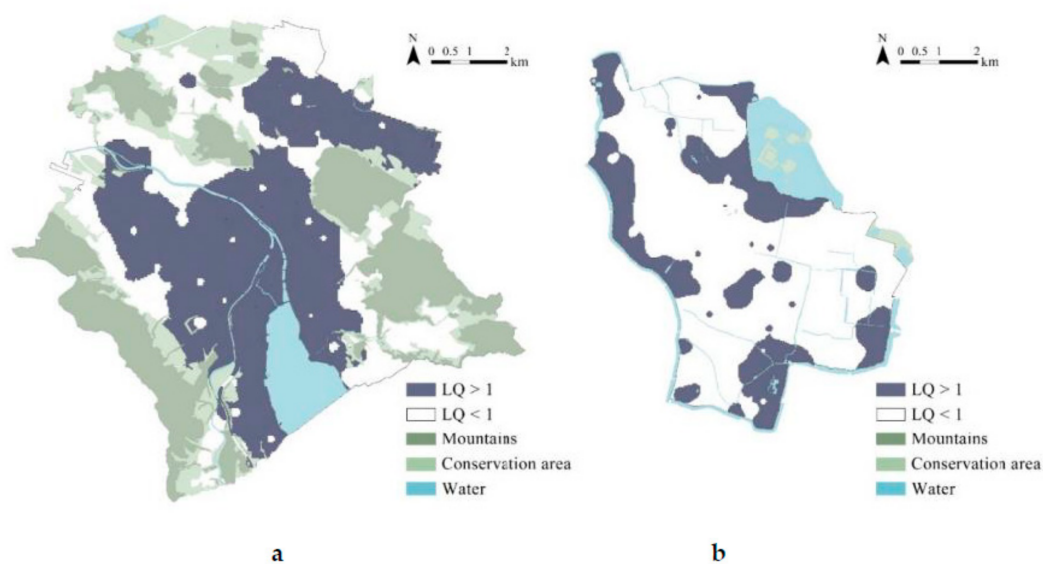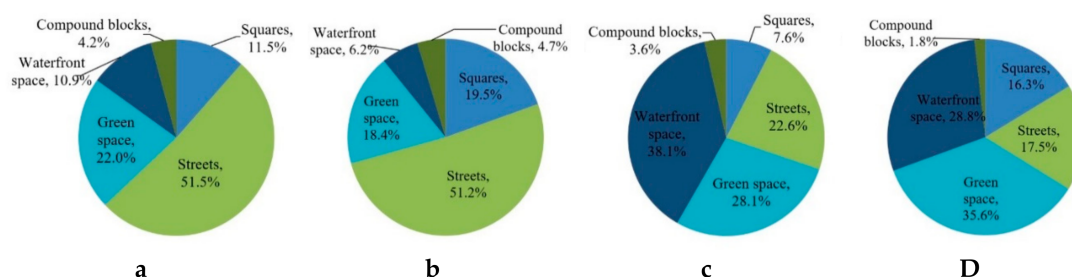

Figure 7. The position of public space in Zurich and the old city of Nanjing: (**a**), Zurich; (**b**), The old city of Nanjing.

In conclusion, the general pattern of the public space between Zurich and the old city of Nanjing mainly shows two characteristics and differences: first, the public space of Zurich is concentrated inside the city, showing a descending trend from the center to the periphery of the city. The public space in the old city of Nanjing, in contrast, is concentrated in the periphery of the city, with the proportion of public space increases from the inside to the periphery of the city. Second, the proportion of the land for public space in Zurich takes a dominant position in most of the urban areas, with the general pattern being relatively continuous and uniform. In contrast, in the old city of Nanjing, the proportion of public space land is lower than the urban average in most of the built-up areas, and the continuity and uniformity of the public space layout are relatively low.

4.2. The Quantitative Comparison Results of the Type Pattern

According to the type of urban public space as determined in above Section 2.5, the type of composition of public space in Zurich and the old city of Nanjing is obtained statistically as shown in Figure 8. It can be seen that the public space of Zurich is dominated by streets, followed by green space and squares. In the public space of the old city of Nanjing, waterfront space accounts for the largest area, while the sites of green space have the largest number. The soft public space in the old city of Nanjing, including green space and waterfront space, occupies the main body with its absolute

area exceeding that of Zurich. However, the share of hard public space, including streets, squares, and compound blocks, is only about one-third of that of Zurich, much less than two-thirds (area ratio) and three-quarters (quantity ratio) in Zurich. The difference is mainly due to the wide disparity in the area and quantity of streets in the two cities. Linear street space, as a typical form of public space, has played an important cohesion role in traditional Chinese towns, but the analysis results show that there is a distinct lack of linear public space in contemporary Chinese cities, as represented by Nanjing. Further statistics are made on the characteristic indexes of the five types of public space in Zurich City and the old city of Nanjing, as shown in Table 2.

Figure 8. The type composition of public space in Zurich and the old city of Nanjing: (**a**) The area composition of public space of Zurich; (**b**) The quantity composition of public space of Zurich; (**c**) The area composition of public space of the old city of Nanjing; (**d**) The quantity composition of public space of the old city of Nanjing.

Squares. The square area of Zurich accounts for 1.3% of the total urban construction land area, and the sub-item data are distributed in a state of positive skewness, in the form of sharp peaks. It reflects that the data distribution shows a trend of being concentrated in the low-value area, and is dispersed in the high-value area, and the number of squares with a small area is relatively large. The square area in the old city of Nanjing accounts for 0.6% of the total urban construction land area; the data distribution shows a trend of being more concentrated in the low-value area. According to the perimeter index, the mean and median values of the perimeter of Zurich squares are greater than those of Nanjing, which is consistent with those of the area index. The data fluctuation degree of the two is small and the disperse trend is less obvious.

Streets. The street area and perimeter of Zurich are much larger than those of Nanjing: the total length of streets in Zurich is 150518 m, which is 4.0 times that of Nanjing; the ratio of the area of streets to the urban construction land of Zurich is 5.6%, which is 3.2 times that of Nanjing; and the number of streets in Zurich is 330, which is 5.6 times that of Nanjing. The data distribution of the two cities presents a similar trend of positive skewness and sharp peak.

Green space. The number and share of the sites of green space in the two cities are basically equivalent: There are a total of 119 sites of green space in Zurich, accounting for 2.4% of the total urban construction land area. In contrast, there are a total of 120 sites of green space in the old city of Nanjing, accounting for 2.2% of the total urban construction land. The data distribution of the area and the perimeter are both in the state of positive skewness, and the sharp peak feature of the area data is especially prominent, reflecting the high data dispersion of the high-value area.

Waterfront space. The total area and total quantity of waterfront space in the old city of Nanjing are 2.0 times and 2.4 times as much as those in Zurich respectively, and the proportion of urban construction land is 2.5 times as much as that in Zurich. The waterfront space in Zurich is mainly distributed along the Limmat River and Zurich Lake which pass through the city center, while the waterfront space in the old city of Nanjing is basically in the periphery of the old city.

Compound blocks. By comparing compound blocks, we can find that the area and quantity of Zurich's compound blocks are larger. Compared with other types of public space, the distribution of area and perimeter data shows a trend of positive skewness and sharp peak with a gentle distribution pattern.

Table 2. The characteristics of public space area and perimeter of type-based statistics in Zurich and the old city of Nanjing.

Type	Index	City	Maximum	Minimum	Sum	Mean	Meridian	Standard Deviation	Coefficient of Variation	Skewness	Kurtosis
Square	Area m^2	Zurich	29435	275	664487	5274	3880	4631	0.878	2.116	6.582
		Nanjing	56477	114	251083	4565	1489	9593	2.101	4.194	18.955
	Perimeter m	Zurich	1230	67	46966	373	327	215	0.576	1.301	2.067
		Nanjing	1351	43	16303	296	205	274	0.926	2.094	5.197
Street	Area m^2	Zurich	63334	237	2969633	8999	5565	9530	1.059	2.567	8.733
		Nanjing	61967	621	749046	12696	6585	8384	0.660	2.409	7.454
	Perimeter m	Zurich	5790	86	379077	1149	857	957	0.833	1.875	4.466
		Nanjing	3777	284	94431	1601	943	905	0.565	1.796	4.442
Green space	Area m^2	Zurich	150084	284	1267257	10649	4641	18240	1.713	4.808	30.269
		Nanjing	198190	56	930534	7754	1545	23503	3.031	6.312	44.504
	Perimeter m	Zurich	2721	72	59386	499	380	400	0.802	2.264	8.127
		Nanjing	3190	38	49568	413	191	571	1.383	3.155	10.641
Waterfront space	Area m^2	Zurich	137504	348	626591	15665	4509	29874	1.907	3.105	9.567
		Nanjing	213557	121	1262402	13014	3114	29614	2.276	4.310	22.826
	Perimeter m	Zurich	12230	106	55756	1394	750	2054	1.473	4.076	19.404
		Nanjing	8573	45	78744	812	412	1224	1.507	3.711	17.843
Compound block	Area m^2	Zurich	44471	1177	243117	8104	4665	9085	1.121	2.537	7.703
		Nanjing	40772	3449	118007	18693	11772	15085	0.807	0.603	-2.401
	Perimeter m	Zurich	2266	79	30085	813	616	564	0.694	0.782	-0.141
		Nanjing	6689	517	12640	2528	1794	2272	0.899	1.440	1.908

Note: Generally speaking, length rather than perimeter shall be used as the comparative index for streets. In view of the fact that perimeter value is easy to obtain, and street width can be ignored in comparison with length, street length should be approximately measured by perimeter value.

In general, the type pattern of the public space of the old city of Nanjing is compared with that of the city of Zurich: First, the proportion of the waterfront space in the total urban construction land of the old city of Nanjing is greater than that of Zurich, the proportion of the green space of the two cities is equivalent, and the share of square, street, and compound block of Nanjing is smaller than that of Zurich. Less street and square space is the root cause of the fact that the proportion of the public space of the old city of Nanjing is lower than that of Zurich. Second, the data distribution of the compound block of the two cities is relatively gentle, and the sub-item data of the other four types of public space are all concentrated in the low-value area and dispersed in the high-value area. This trend in the old city of Nanjing is more obvious, which indicates that there is more distribution of small and medium public space in the old city of Nanjing. Third, the uniform distribution of square and green space patterns in the old city of Nanjing is less than that of Zurich, and the continuity of the street is weaker than that of Zurich.

4.3. The Quantitative Comparison Results of the Scale Pattern

The area and quantity of urban public space of different scale grades in Zurich and the old city of Nanjing are counted respectively; Table 3, Figure 9, and Figure 10 are obtained.

As can be inferred from Figure 9 and Table 3, if measured by the proportion of the area of public space in the total area of urban public space based on scales, the land area of the public space of Zurich and the old city of Nanjing has a similar extreme value: in terms of the maximum value, the large public space with an area of 10–100k m^2 constitutes the main body, and the large public space accounts for more than half of the total area of the urban public space. In terms of the minimum value, the proportion of the small public space of less than 1k m^2 is very small, less than 2% of the total area of the public space. On the other hand, the difference between Zurich and the old city of Nanjing includes that the proportion of medium-large and medium public space of Zurich is larger, and the proportion of extra-large public space of Zurich is smaller, while the opposite applies for the old city of Nanjing.

In terms of the quantity composition (Figure 10, Table 3), the quantity of medium public space and medium-large public space accounts for the majority, about two-thirds of the total altogether, and small public space of Zurich accounts for a small part. In contrast, the number of small public space sites in the old city of Nanjing is the largest, while the site number of medium, medium-large, large, and extra-large public space in Nanjing shows a trend of decreasing in turn.

In sum, Zurich has less small and extra-large public space but more medium, medium-large, and large public space; the scale gradient of Zurich shows a fusiform middle distribution state of "small on both ends and large in the middle." In contrast, in the old city of Nanjing has a larger number of small public space sites and a higher area proportion of extra-large public space; the scale gradient of the old city of Nanjing shows a bipolar distribution state of "large on both ends and small in the middle."

Table 3. The scale pattern comparison of public space in Zurich and the old city of Nanjing.

| Scale	Division Standard (m^2)	City	Total Area (ha)	Percentage	Total Number	Percentage
Small	< 1k	Zurich	2.41	0.4%	41	6.4%
		Nanjing	5.30	1.6%	104	31.0%
Medium	1–4k	Zurich	59.34	10.3%	231	35.8%
		Nanjing	20.66	6.2%	89	26.5%
Medium-large	4–10k	Zurich	134.63	23.3%	208	32.2%
		Nanjing	47.66	14.4%	75	22.3%
Large	10–100k	Zurich	339.82	58.9%	162	25.1%
		Nanjing	185.29	56.0%	64	19.0%
Extra-large	> 100k	Zurich	40.92	7.1%	3	0.5%
		Nanjing	72.20	21.8%	4	1.2%
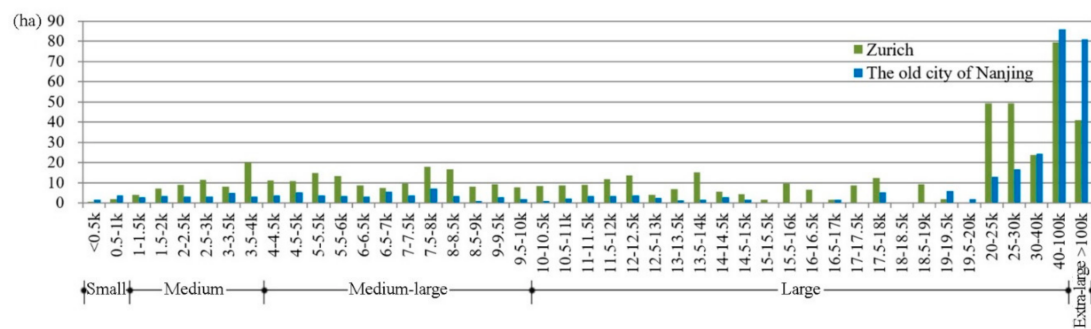
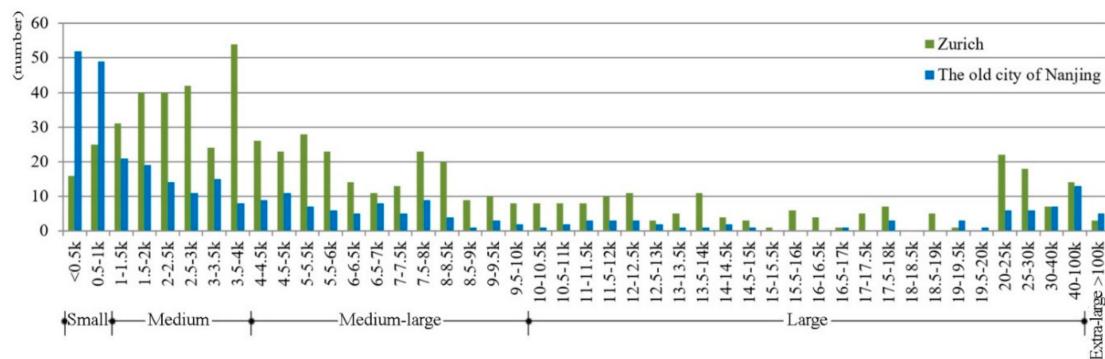**Figure 9.** The scale-area relationship of public space in Zurich and the old city of Nanjing.

Figure 10. The scale-quantity relationship of public space in Zurich and the old city of Nanjing.

5. Discussion

The above quantitative comparison results reveal the significant differences in the general pattern, type pattern, and scale pattern between Zurich and the old city of Nanjing. The characteristics of Zurich's public space pattern can be concluded: in terms of the general pattern, the public space is concentrated within the city, especially in the center of the city; in terms of the type pattern, the streets account for the main body where the continuity is strong and the pattern of square and green space is more uniform; and in terms of the pattern of scale, most of the public space sites are medium, medium-large, and moderate scale of large ones and the orthodox centrality is replaced by a clear and coherent public space system, which is consistent with its deep-rooted democratic culture. In contrast, for Nanjing city, in terms of the general pattern, the distribution of the public space is relatively scattered, and the main public space is concentrated in the periphery of the city. In terms of type pattern, the space of streets and squares is insufficient and the gap of linear public space of streets is large, which leads to the weak sense of continuity of public space. In terms of scale pattern, the number of small public space sites is large, the area proportion of extra-large public space is large, the public space at the middle level is less, and the scale gradient is in the form of polar distribution.

Therefore, the difference between the old city of Nanjing and Zurich public space is significant, which exists not only in quantity, scale, or type, but also in the pattern of the urban public space system including the location choice, distribution status, and service level. The European cities represented by Zurich have a profound culture of public space and a tradition of public life, and their civic tradition has laid the role of urban public space in urban society. The urban planning in each stage has effectively promoted the sustainable development of the public space in the city, and formed a relatively reasonable pattern of public space. The pattern of Zurich's public space has gradually come into being based on superimposition in the game of such two forces as bottom-up spontaneous development and top-down planning, and is the rational result of urban self-renewal. The third great prosperity of Zurich's urban public space since the 1980s has resulted in the use of space dominated by culture and economy, which is largely due to the historical process of Zurich's transition from a passively-formed

financial center into an open and vibrant regional central city [50]. At the same time, the promulgation of a number of urban construction policies has also provided a guarantee for Zurich's public space pattern. For instance, Urban Space 2010 released in 2003 [40], by integrating the specific public spaces with different features, contents and forms under clear control levels, successfully incorporated the public space system of Zurich into the trans-regional and national context it has today. *The Green Book of Zurich (Das Grünbuch der Stadt Zürich: integral planen– wirkungsorientiert handeln)* [51] published in 2006 set forth the rough measures of the overall strategy, implementation program, ten-year objective and action plan for the sustainable development of open green space, which were put into practice with obvious effectiveness. In contrast, the Chinese cities as represented by the old city of Nanjing lacked the foundations to form independent and autonomous public space for a long time. Although the public consciousness and public living ability of the citizens are growing rapidly, they are still relatively weak as a whole. The causes of the present public space pattern of the old city of Nanjing are that the costs of constructing public space on the edge of the old city is relatively small, so a large number of public space sites are concentrated in the periphery. The main considerations of urban roads are motor vehicle passage and incremental traffic of motor vehicles; the walking space is minimized which is manifested in the lack of street public space. It is difficult to add new public space sites in the built-up area, and most of them adopt the form of "using all available space," so the number of small public space sites is large. Public space places emphasis on image display function, so the area of extra-large public space is large. At the end of 2018, Nanjing City announced the *Public Space Planning of the Main City of Nanjing* [52] which indicates that the important role of public space system in urban development has been recognized to a certain extent; however, there is still a lack of effective land division management and construction control means for public space construction in the current urban planning practice.

These seem to have explained why it is often intuitively believed that the urban public space of Nanjing is relatively scarce in the real urban experience, although the proportion of public space area to urban construction land area in the old city of Nanjing and Zurich is not significantly different (7.7% and 10.8%, respectively). Zurich's public space model conforms to the concentric law of human public behavior and activities: the richer the public life is, the more public space will be arranged. This meets the needs of human beings and helps to form a friendly environment for walking and public activities. However, the centrifugal layout of public space in the old city of Nanjing is not conducive to daily use nor to the efficiency of public space. More importantly, Zurich's urban public space and its surrounding buildings, as well as the events that take place therein, basically represent the city as a whole. Public space plays an overarching role closely related to urban structure, residents' life styles, and its image, and shows the adaptability of making gradual changes and adjustments over a lapse of time, which transcends appearance beautification, public life, and social function integration and proves to be its fundamental value. In other words, the permanent charm of Zurich comes from the power of its public space, which is brought about by the pattern of public space. Once a public space pattern is integrated into the complex urban system as an overarching factor, the city will obtain a public spirit based on the public dimension, as well as the motive force of independent and sustainable development. Compared with the mechanical division of land use and the separate planning of buildings from the conventional method, this is a more effective way to organize urban space. In contrast, if urban public space is only used as the reuse of the remaining space among single buildings, there is no correlation among the scattered outdoor space sites, and buildings exist in an introverted way. It would be impossible for diversified vitality and a friendly atmosphere of social public activities to come into being.

It can be seen that the criteria of public space, as based on the total quantity or per capita index, can only reflect some of the characteristics of public space, and the "quantity" of public space is not equivalent to "quality" whether in terms of the whole or the part of the city. It is the public space pattern, instead of the total quantity, that plays a decisive role in the city. In China's real estate development projects, the government usually stipulates that the green space rate should not be less than 30% of the total land area, so that the current planning designates undevelopable corners and sporadic land plots

as public green space without considering the needs of the public. Therefore, the formulation of urban norms, regulations, and design guidelines should not only emphasize the restriction of quantity, but also attach great importance to the guidance of urban public space pattern. It would be an ideal choice to organize and integrate the city with the public space as the overarching factor. Strengthening the role of the public space in the process of urban sustainable development is conducive to the creation of urban places with more appeal, identity, and cohesion.

As far as the old city of Nanjing is concerned, the focus of the optimization of urban public space pattern is to construct and promote the public space within the old city according to the concentric law of public activities. When the public space forms a more diverse system within the city, it can play a greater role and serve more people and the spatial pattern will become more efficient. The power to attract and accommodate all kinds of social public activities is also the key factor to determine the central characteristics. In the long run, the existing land use within the old city, especially in the central area, should be investigated and analyzed more carefully, so as to discover those spaces with the potentials to be transformed into public spaces and manage them by digital means for future use. This will be of great benefit to increase the amount of sustainable public spaces. However, on the other hand, the land use competition in the city center is also the most intense. It is very difficult to add new, centralized public space in the short term. Linear streets and roads will be the most urgent and the most potential optimization objects. At present, China's urban construction is moving from extensiveness to intensiveness. It is the best strategic opportunity period for reflection, renovation, transformation, and reconstruction of the existing urban public space pattern. The intensity of urban planning and construction and public land ownership in China make the above possible.

A lot of present studies have carried out in-depth exploration to the pattern of green spaces in different cities in developed and developing countries, such as Berlin [53], Paris [54], Baltimore [55], Phoenix [25], Shanghai [26], and so on. But they do not pay attention to a wider topic of urban public space pattern. Based on physical space, this study revealed the structural characteristics and differences of urban public space in different countries through quantitative study, and expanded the quantitative analysis method of public space patterns. It laid a foundation for guiding and regulating the scientific development of urban public space in the future. The spatial analysis framework and technology thus formed can provide inspiration for the research on urban public space in different countries.

6. Conclusions

Taking Zurich and the old city of Nanjing as examples, this study explored the location quotient method to quantify the pattern of urban public space and its physical structure characteristics, aiming to lay a research foundation for promoting the construction and optimization of urban public space. The pattern of urban public space is the result of the comprehensive effect of specific social and cultural form and geographical environments. In this study, it was found that the pattern of urban public space in the old city of Nanjing is significantly different from that in Zurich City. First, the general pattern of public space is reversed. The maximum location quotient of Zurich public space is 9.5, which is located in the urban-core area. The area with a location quotient of greater than one covers 63.3% of the urban construction land. In contrast, the maximum location quotient of urban public space in the old city of Nanjing is 8.5, which is located in the periphery. The area with location quotient of greater than one accounts for only 30.8% of the corresponding urban construction land. Next, the area and quantity of streets are quite different. The street area of Zurich accounts for 51.5% of the total area of public space, and the number of streets accounts for 51.2% of the total number of public space sites, while the corresponding value of the old city of Nanjing is only 22.6% and 17.5%. In addition, the scale gradient of public space is polarized. Both the area ratio and quantity ratio of medium-sized (including medium, medium-large, and large) public space in Zurich exceed 92%, while that of small and extra-large public space is less than 8%. In contrast, the area of medium-sized public space in the old city of Nanjing is less than 77%, the quantity ratio is less than 68%, and all other areas are small or extra-large public spaces. With the quantitative analysis technology based on the ArcGIS platform, the pattern of urban

public space in Zurich presents a clear and logical layout paradigm, which provides a way of guiding urban construction with public space and a worthy reference for other cities.

However, there are some limitations in this study. First, urban public space is conceived in terms of the Western cultural background and social system. Although the authors try to be as neutral as possible, to some extent, the comparative work is still based on references to the European model. The extent to which Zurich's public space model can adapt to China's national conditions and local culture remains to be verified. However, the foothold of this study is not based on the morphological imitation of the European paradigm, but on exploring a feasible way to reshape the urban spatial relationship; that is, to organize the city scientifically and effectively on account of the urban public space system. The setting of the essence of this relationship is based on reference to European cities, but this does not mean that innovation cannot be made in specific forms and means according to the needs of residents. On the contrary, exactly because of the clear demarcation, it is more likely to produce innovation results within the preset framework. Second, urban public space is not only physical space, but also has a more prominent social value attribute with complex influencing factors. While showing certainty and clarity, the quantitative process partly reduces the complexity of the research object. This result lies in the quantitative research method itself, which is fundamentally inevitable. Third, the quantitative study of this research ignores the different needs of users and does not consider the specific differences among different cities and areas which may have an impact on the accuracy of the results. As to whether the method and conclusion of this study can be adapted to cities in different historical, cultural, and spatial contexts, more urban cases should be investigated in the future.

References

1. Carr, S.; Francis, M.; Rivlin, L.G.; Stone, A.M. *Public Space*; Cambridge University Press: New York, NY, USA, 1992.
2. McPhearson, T.; Pickett, S.T.; Grimm, N.B.; Niemelä, J.; Alberti, M.; Elmqvist, T.; Weber, C.; Haase, D.; Breuste, J.; Qureshi, S. Advancing urban ecology toward a science of cities. *BioScience* **2016**, *66*, 198–212. [CrossRef]
3. Whyte, W.H. *The Social Life of Small Urban Spaces*; The Conservation Foundation: Washington, DC, USA, 1980.
4. Gehl, J. *Cities for People*; Island Press: Washington, DC, USA, 2010.
5. Kweon, B.-S.; Sullivan, W.C.; Wiley, A.R. Green common spaces and the social integration of inner-city older adults. *Environ. Behav.* **1998**, *30*, 832–858. [CrossRef]
6. Nadal, L. Discourses of Urban Public Space, USA 1960–1995 A Historical Critique. Ph.D. Thesis, Columbia University, New York, NY, USA, 2000.
7. Rossi, A. *The Architecture of the City*; Ghirardo, D.; Ockman, J., Translators; The MIT Press: Cambridge, MA, USA, 1984.
8. Miao, P. (Ed.) *Public Places in Asia Pacific Cities: Current Issues and Strategies*; Kluwer Academic Publishers: Dordrecht, The Netherlands, 2001.
9. Dong, J. (Ed.) *China Urban Construction History*, 3rd ed.; China Building Industry Press: Beijing, China, 2004.
10. Eastday. Available online: http://sh.eastday.com/m/20171014/u1ai10922681.html (accessed on 14 October 2017).
11. Sitte, C. *The Art of Building Cities: City Building According to Its Artistic Fundamentals*; Stewart, C.T., Translator; Martino Fine Books: Eastford, CT, USA, 2013.
12. Cullen, G. *Townscape*; Reinhold: New York, NY, USA, 1961.
13. Bacon, E.N. *Design of Cities*; Thames & Hudson: London, UK, 1974.

14.   Lynch, K. *The Image of the City*; The MIT Press: Cambridge, MA, USA, 1960.

15.   Jacobs, J. *The Death and Life of Great American Cities*; Penguin Books: Harmondsworth, UK, 1964.

16.   Gehl, J. *Life Between Buildings: Using Public Space*; Van Nostrand Reinhold: New York, NY, USA, 1987.

17.   Habermas, J. *The Structural Transformation of the Public Sphere: An Inquiry into A Category of Bourgeois Society*; Burger, T., Translator; Polity Press: Cambridge, UK, 1989.

18.   Arendt, H. *The Human Condition*; The University of Chicago Press: Chicago, IL, USA, 1958.

19.   Mitchell, D. *The Right to the City: Social Justice and the Fight for Public Space*; The Guilford Press: New York, NY, USA, 2003.

20.   Teitz, M.B. Toward a theory of urban public facility location. *Pap. Reg. Sci.* **1968**, *1*, 35–51. [CrossRef]

21.   DeVerteuil, G. Reconsidering the legacy of urban public facility location theory in human geography. *Prog. Hum. Geogr.* **2000**, *24*, 47–69. [CrossRef]

22.   McAllister, D.M. Equity and efficiency in public facility location. *Geogr. Anal.* **1976**, *8*, 47–63. [CrossRef]

23.   Bigman, D.; ReVelle, C. An operational approach to welfare considerations in applied public-facility-location models. *Environ. Plan. A* **1979**, *11*, 83–95. [CrossRef]

24.   Wolch, J.R.; Byrne, J.; Newell, J.P. Urban green space, public health, and environmental justice: The challenge of making cities 'just green enough'. *Landsc. Urban Plan.* **2014**, *125*, 234–244. [CrossRef]

25.   Ibes, D.C. A multi-dimensional classification and equity analysis of an urban park system: A novel methodology and case study application. *Landsc. Urban Plan.* **2015**, *137*, 122–137. [CrossRef]

26.   Shen, Y.N.; Sun, F.Y.; Che, Y. Public green spaces and human wellbeing: Mapping the spatial inequity and mismatching status of public green space in the Central City of Shanghai. *Urban For. Urban Green.* **2017**, *27*, 59–68. [CrossRef]

27.   Talen, E. Visualizing fairness: Equity Maps for Planners. *J. Am. Plan. Assoc.* **1998**, *64*, 22–38. [CrossRef]

28.   Nicholls, S. Measuring the accessibility and equity of public parks: A case study using GIS. *Manag. Leis.* **2001**, *6*, 201–219. [CrossRef]

29.   Wei, F. Greener urbanization? Changing accessibility to parks in China. *Landsc. Urban Plan.* **2017**, *157*, 542–552. [CrossRef]

30.   Rigolon, A.; Browning, M.; Jennings, V. Inequities in the quality of urban park systems: An environmental justice investigation of cities in the United States. *Landsc. Urban Plan.* **2018**, *178*, 156–169. [CrossRef]

31.   Mulíček, O.; Osman, R. Rhythm of urban retail landscapes: Shopping hours and the urban chronotopes. *Morav. Geogr. Rep.* **2018**, *26*, 2–13. [CrossRef]

32.   Moudon, A.V.; Lee, C.; Cheadle, A.D.; Garvin, C.; Johnson, D.; Schmid, T.L.; Weathers, R.D.; Lin, L. Operational definitions of walkable neighborhood: Theoretical and empirical insights. *J. Phys. Act. Health* **2006**, *3*, 99–117. [CrossRef]

33.   Marshall, S. *Streets & Patterns*; Spon Press: Abingdon, UK, 2005.

34.   Hillier, B.; Hanson, J. *The Social Logic of Space*; Cambridge University Press: London, UK, 1984.

35.   Chen, Y.; Liu, T.; Liu, W. Increasing the use of large-scale public open spaces: A case study of the North Central Axis Square in Shenzhen, China. *Habitat Int.* **2016**, *53*, 66–77. [CrossRef]

36.   Nesbitt, L.; Meitner, M.J.; Girling, C.; Sheppard, S.R.J.; Lu, Y. Who has access to urban vegetation? A spatial analysis of distributional green equity in 10 US cities. *Landsc. Urban Plan.* **2019**, *181*, 51–79. [CrossRef]

37.   Donahue, M.L.; Keeler, B.L.; Wood, S.A.; Fisher, D.M.; Hamstead, Z.A.; McPhearson, T. Using social media to understand drivers of urban park visitation in the Twin Cities, MN. *Landsc. Urban Plan.* **2018**, *175*, 1–10. [CrossRef]

38.   Trancik, R. *Finding Lost Space: Theories of Urban Design*; John Wiley & Sons Inc.: New York, NY, USA, 1986.

39.   Rawls, J. *A Theory of Justice*; The Belknap Press of Harvard University Press: Cambridge, MA, USA, 2005.

40.   Zürich, S. *Stadträume 2010: Strategie für die Gestaltung von Zürichs öffentlichem Raum*; Druckerei Kyburz: Dielsdorf, Switzerland, 2006.

41.   Batty, M. *Cities as Fractals: Simulating Growth and Form*; Springer: New York, NY, USA, 1991.

42.   Xu, N.; Cheng, Y.; Xu, X. Using Location Quotients to Determine Public–Natural Space Spatial Patterns. *Sustainability* **2018**, *10*, 3462. [CrossRef]

43.   Cervero, R. *The Transit Metropolis: A Global Inquiry*; Island Press: Washington, DC, USA, 1998.

44.   Stadt Zürich; Präsidialdepartement; Statistik Stadt Zürich. *Essential Zurich*; Statistik Stadt Zürich: Zürich, Switzerland, 2009.

45.   Nanjing. Available online: http://tjj.nanjing.gov.cn/tjxx/201803/t20180327_494674.html (accessed on 27 March 2018).

46.   Zurich. Available online: http://en.wikipedia.org/wiki/Zurich (accessed on 20 June 2019).

47.   Nanjing. Available online: http://tjj.nanjing.gov.cn/wzdt (accessed on 11 April 2011).

48.   Xu, N. *The Pattern and the Evaluation Research of Urban Public Space Based on Efficiency and Equity Perspectives*; Southeast University: Nanjing, China, 2013.

49.   Li, L. (Ed.) *Nanjing Almanac 2009*; The editorial office of Nanjing Almanac: Nanjing, China, 2009.

50.   Eisinger, A.; Reuther, I.; Eberhard, F.; Lüscher, R. *Building Zurich*; Birkhäuser: Basel, Switzerland, 2007.

51.   Eine Dienstabteilung des Tiefbau- und Entsorgungsdepartements Grün Stadt Zürich. *Das Grünbuch der Stadt Zürich: Integral Planen– Wirkungsorientiert Handeln*; Grün Stadt Zürich: Zürich, Switzerland, 2006; Available online: https://www.stadt-zuerich.ch/content/dam/stzh/ted/Deutsch/gsz/Angebote%20und%20Beratung/Publikationen%20und%20Broschueren/Publikationen/Gruenbuch-gesamt_pdf.pdf. (accessed on 27 March 2018).

52.   Public Space Planning of the Main City of Nanjing. Available online: http://ghj.nanjing.gov.cn/njsghj/201812/t20181214_1299286.html (accessed on 14 December 2018).

53.   Kabisch, N.; Haase, D. Green justice or just green? Provision of urban green spaces in Berlin, Germany. *Landsc. Urban Plan.* **2014**, *122*, 129–139. [CrossRef]

54.   Cohen, M.; Baudoin, R.; Palibrk, M.; Persyn, N.; Rhein, C. Urban biodiversity and social inequalities in built-up cities: New evidences, next questions. The example of Paris, France. *Landsc. Urban Plan.* **2012**, *106*, 277–287. [CrossRef]

55.   Boone, C.G.; Buckley, G.L.; Grove, J.M.; Sister, C. Parks and people: An environmental justice inquiry in Baltimore, Maryland. *Ann. Assoc. Am. Geogr.* **2009**, *99*, 767–787. [CrossRef]