

Article

A Conceptual Guideline to Age-Friendly Outdoor Space Development in China: How Do Chinese Seniors Use the Urban Comprehensive Park? A Focus on Time, Place, and Activities

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Abstract: The aim of this paper is to narrow the gap between the theoretical findings from past studies and current open space development through evaluating the behavior pattern and landscape preferences of seniors in urban parks in China. Combining an on-site observational approach with a questionnaire, the research has taken place in two successful traditional comprehensive parks in Xi'an, Shaanxi, China. The results for time, place, and activities were analyzed and depicted in figures. Design guidelines have been provided based on the analysis; new perspectives for further investigations have been pointed out for landscape architects and urban planners to carry on exploring the process of establishing a successful age-friendly outdoor space.

Keywords: age-friendly outdoor space; senior park user; behavior pattern; landscape preference; design guidelines

1. Introduction

Global aging is shifting population demographics. According to the World Population Prospect (2017) [1], the number of people aged 60 and over has achieved 962 million in 2017 globally. It is expected that the number of seniors will be more than doubled in 2050 and more than tripled by 2100, reaching 2.1 billion and 3.1 billion respectively. The aging population has become one of the most significant social groups whom require enormous attention from society. World Health Organization (2007) [2] has introduced active aging (the process of optimizing opportunities for health, participation and security in order to enhance the life quality as people age) to enhance the well-being of urban seniors [3]. An engagement in moderate physical activities is proven to be the key element of achieving a healthy and active lifestyle which is promoted by active aging [4,5]. The benefits of physical activities include the enhancement of body balance, strength, and mental health [6–8]. The physical activities discussed in this paper include active activities and passive activities. Gehl [9] has stated that people can use public spaces both actively and passively. Active activities are defined as activities that require an impassioned experience, vibrant participation and active presence in an outdoor space. The human body is constantly moving when performing active activities, such as dancing. Passive activities are activities that make passive contact with the surrounding environment. The energy consumption of these activities is much lower compared to active activities. Passive activities are participated in through a moderate manner; the human body stays in a still position mostly, such as sitting [9].

Seniors are encouraged to stay physically active outdoors. Existing literature has demonstrated that more engagement with green public spaces will improve one's overall well-being [10–15]. A large amount of studies available on age-friendly outdoor spaces show results that conclude: (i) outdoor

spaces should be safe, functional and provide attractive physical activities for seniors [16]; (ii) seniors prefer green common spaces with vegetation, lighting, seating, and other structures that provide shelter from wind and the sun [17–19]; (iii) seniors appreciate nuisance-free parks with facilities such as toilets and cafes, high quality park maintenance, attractive activities, and limited surrounding traffic flow [18–20]; (iv) three types of environmental support can enhance the well-being of seniors, including participation in physical activity, exposure to natural landscape, and social interactions [20]. Despite the absence of a universal design standard on age-friendly outdoor development, the definition of a successful age-friendly outdoor space is portrayed in these studies.

However, most current open space developments are failing to accommodate urban seniors. Many scholars have discovered that people's increase in age is inversely proportional to their physical activity levels. It is reported that most seniors globally are inactive [8,21,22]: 45% of Europeans aged around 60 are physically inactive [23]; only 20% of older females and 31% of older males are capable of achieving the 2 h and 30 min moderate physical activities per week suggested by WHO [24]. It is also pointed out that seniors tend to avoid or reduce their frequency of park visits [25,26]. Therefore, seniors prefer doing passive activities at home instead of engaging with outdoor environments productively [8,27].

Gaps exist between the theoretical findings presented in past studies and the ongoing development of age-friendly outdoor spaces in practice. Apart from defining successful age-friendly outdoor spaces, there is a lack of explanation on the process of establishing it or identifying which landscape details are indispensable in past studies. In other words, explanations on types of landscape elements or spatial configurations that could effectively enhance the engagement between users and the environment were missing. Also, in much of the existing literature on aging studies in the developed nations, the behavior patterns and landscape preferences of seniors living in the developing world remain unknown [28].

The aim of this study is to narrow the gap between past research and current open space developments through evaluating the behavior patterns and landscape preferences of seniors in urban parks in China. According to the Ministry of Civil Affairs of the People's Republic of China (2016) [29], 16.15% of the total population were aged 60 and over. China, the world's most populous nation, is classified as an aging society. (According to the UN (1982), an aging society is defined as one where the number of people aged 60 and over exceed 10% of the region or nation's total population [30]). Chinese parks are used differently to those in the Western world [31,32]. Urban comprehensive parks in China are often flooded with various activities and social groups. It is commonly observed that Chinese seniors are the largest urban park user group by age, and they carry out a diverse range of activities. A standard Northern traditional comprehensive park would host nearly 3000 senior visitors daily on average all year round [31]. The presence of a large population of urban senior park users in China makes Chinese urban comprehensive parks the best and most suitable places to evaluate the behavior patterns and landscape preferences of seniors.

To design and construct a successful age-friendly outdoor space, it is crucial to evaluate the current behavior patterns and landscape preferences of seniors in urban open spaces to identify the specific landscape characteristics that are related to the performance of physical activities. The key discussions relate to time, place, and activity. The following research question will be addressed:

- What times of the day do seniors prefer to be in parks?
- What landscape features do they prefer in parks? What landscape features do they avoid?
- What activities do they participate in, in their preferred space?

Findings on these issues will serve as the initial guidelines that can lead to further theoretical research and practical design breakthroughs on creating successful age-friendly outdoor spaces.

2. Material and Method

2.1. Study Sites

Two traditional comprehensive parks in Xi'an, Shaanxi, China, were selected as the study sites: Lianhu Park and Revolution Park. Xi'an is an aging society [30]. By the end of 2016, the urban

population of Xi'an had reached 8.83 million. The population of seniors who are 65 and above accounted for 14.26% of the overall urban population [33]. These two parks were selected as they are the only parks located in the old town of Xi'an, they share a similar spatial configuration, and are very popular urban public spaces

2.2. Post-Occupancy Evaluation (POE)

Behavior observations (objective data) and questionnaires (subjective data) were employed to explore current senior behavior patterns and landscape preferences in the study sites.

2.2.1. Behavior Observation

Direct on-site observation is the most effective technique to discover the actual use of open spaces. In terms of designing age-friendly outdoor spaces, the aim was to identify how seniors interact with the designed landscape elements.

According to landscape features, Revolution Park was divided into 15 zones and Lianhu Park was divided into 19 zones. Then, a feasible walk-through was planned to observe every zone in the park. The detailed data collection took place in April 2016 and 2017. April was chosen, because with mild weather in Xi'an (20 °C on average), it is suitable for various outdoor activities. Data from five weekdays and two weekend days were collected and averaged to find patterns of behavior and landscape preferences of urban seniors. When weather conditions were unsuitable, or a special event was taking place, data for a specific day was abandoned and another collection day was arranged to ensure normality of use. The observation of Revolution Park took place on 8–13 and 21 April 2016. The observation of Lianhu Park took place on 7, 8, 11, 12, 17 and 23 April 2017.

Six time periods of two hours were planned for daily observation: 06:30–08:30, 08:30–10:30, 10:30–12:30, 12:30–14:30, 14:30–16:30, and 16:30–18:30. Starting at the main entrance, the walk-through visited each zone, staying about 10 min in each. All seniors present and doing activities which lasted more than five minutes were recorded on an activity map. This on-site observation was conducted by two researchers.

2.2.2. Questionnaires

A total of 150 self-administrated questionnaires containing background information, frequency of park visits, reasons for visiting parks and staying in certain places to do activities were circulated to seniors in Lianhu Park on 8 and 17 April 2017. The questionnaire was conducted through purposive sampling (non-random sampling), as the targeted research subjects were people who are 60 and above. In addition, a short face-to-face interview was followed after the completion of questionnaires, which aimed to gain feedback from urban seniors about park conditions. The aim of this research was informed to every interviewee at the beginning of the survey.

3. Results

3.1. Time

Seniors prefer to visit the park at two time periods daily: 08:30–10:30 and 14:30–16:30. Figure 1 shows the average of seniors in the study zones of both parks at each time interval during the seven days.

3.2. Place

The next step was to determine when the number of seniors peaked in the park, where they prefer to stay, and where they avoid visiting. The data from the seven days is similar; thus, the data from one observation day at each park was chosen to demonstrate the distribution of senior visitors in both (Figure 2). (Figure 1).

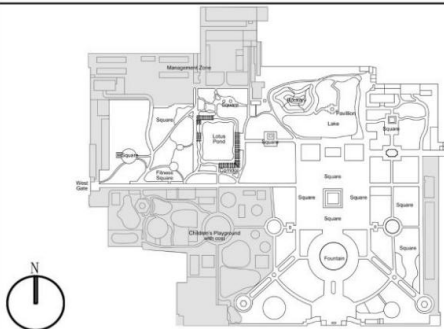
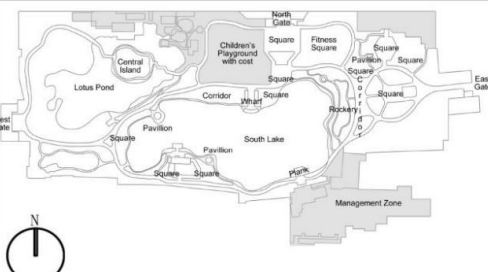
Study Sites	Site Description	Date of Construction	Size	Layout	Average sum of elders doing long-term activities in seven days					
					6:30-8:30	8:30-10:30	10:30-12:30	12:30-14:30	14:30-16:30	16:30-18:30
Revolution Park	-Traditional Comprehensive Parks -Located in the old town (within the ancient wall) of Xi'an, Shaaxi, China -Popular public spaces	1929	10ha	 Popularity 	87	117	72	96	186	79
Lianhu Park	-Share similar spatial configuration including squares, private spaces, artificial hills, water bodies, leisure fitness zones, corridors with distinctive features, and other landscape details such as seats, vegetation and necessary facilities	1916	18ha	 Popularity 	76	300	92	73	282	128

Figure 1. Study Sites Description and Time Analysis.

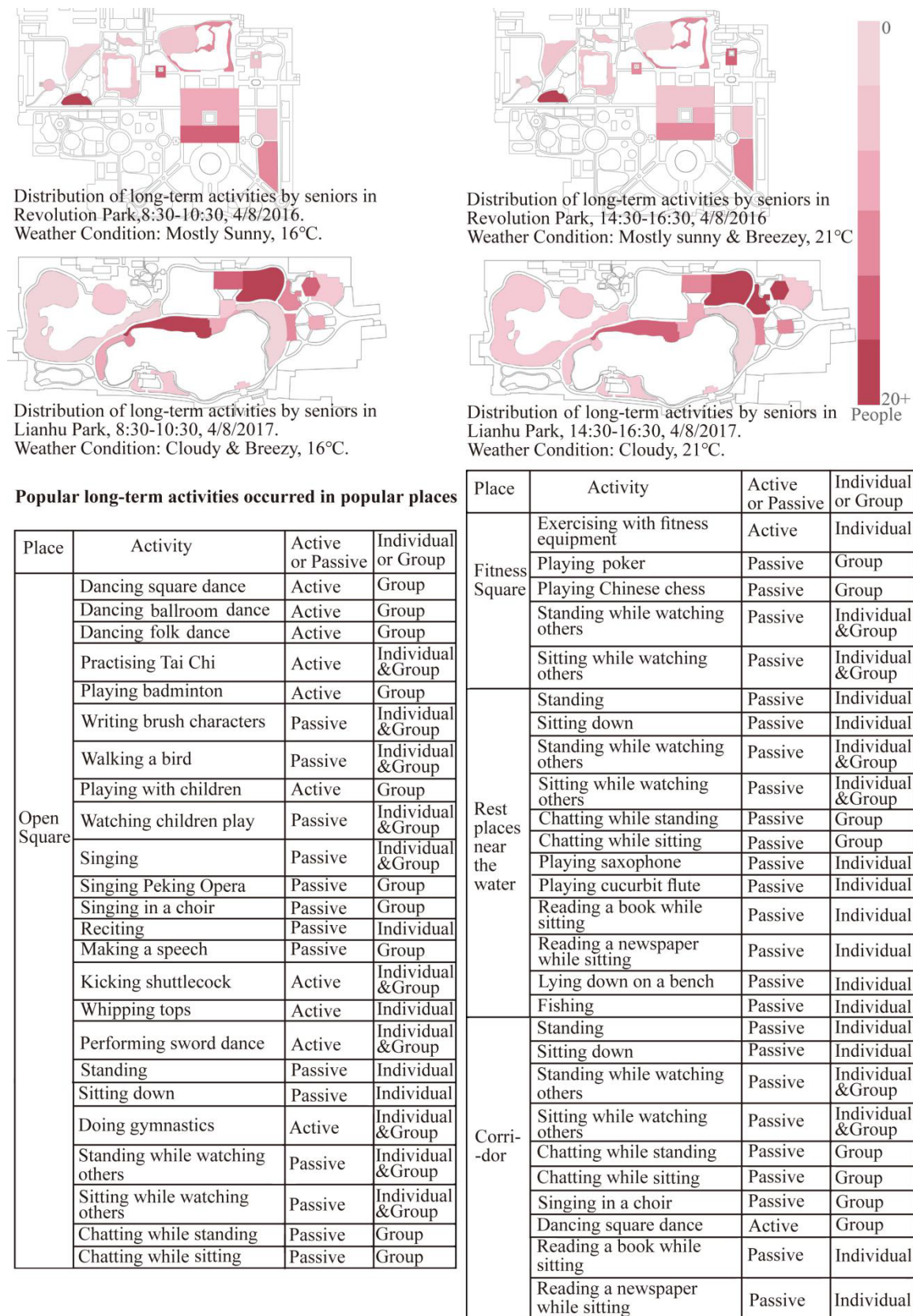


Figure 2. Place Analysis and Activity Analysis.

Seniors prefer to visit similar places within these two parks: the fitness square, entrance square, comparatively small squares, corridors, and reasonable-sized facilities that are next to the water. Common places seniors avoid are rockeries, private spaces, and squares next to the water.

3.3. Activity

A summary of long-term activities occurring in popular places is presented in Figure 2.

3.4. Questionnaire

In total, 124 questionnaires were valid, including 62 from males and 62 from females, shown in Table 1.

Table 1. Questionnaire Analysis.

	Number	%
Gender		
male	62	50
female	62	50
Age		
60–69	81	65.3
70–79	27	21.8
80 and over	16	12.9
Transportation to the park		
within 10 min walk	56	45.2
around 20 min walk	27	21.8
around 30 min walk	12	9.7
other means of transportation	29	23.4
Living arrangement		
alone	14	11.3
with partner	47	37.9
with partner and kids	35	28.2
with kids	19	15.3
other arrangement	9	7.3
Visiting composition		
alone	75	60.5
2 people together	40	32.3
3 people and more	9	7.3
Visiting frequency		
everyday	53	42.7
often	42	33.9
occasionally	29	23.4
barely	0	0
Time of visitation		
6:30–8:30	20	16.1
8:30–10:30	49	39.5
10:30–12:30	12	9.7
12:30–2:30	24	19.4
14:30–16:30	53	42.7
16:30–18:30	13	10.5
Duration of stay		
more than 5 h	3	2.4
3–5 h	21	16.9
around 2 h	61	49.2
around 1 h	30	24.2
around 30 min	7	5.6
10–20 min	1	0.8
less 10 min	1	0.8

Table 1. Cont.

	Number	%
Reason for visiting the park		
rest and relaxation	96	77.4
physical exercise	83	66.9
enjoy the natural scenery	50	40.3
leisure and entertainment	44	35.5
communication with others	42	33.9
accompany family and friends	18	14.5
go through	3	2.4
Landscape and spatial characteristic preference		
tree shade	39	31.5
beautiful scenery	33	26.6
quiet	33	26.6
open wide	33	26.6
have seats	31	25
observe others	28	22.6
close to the water	27	21.8
have sunshine	24	19.4
fitness equipment	19	15.3
lush vegetation	19	15.3
feel lively	14	11.3
structures provide rest places	12	9.7
good view	11	8.9
flat surface	11	8.9
shadow provided by structures	9	7.3
others	8	6.5
close to the entrance/exit	6	4.8
feel safe	5	4
fragrant vegetation	2	1.6
far away from water	2	1.6
feel private	1	0.8
far away from entrance/exit	0	0
people cannot see me	0	0
no vegetation	0	0
artificial hills	0	0

Most respondents are seniors who are aged between 60 and 69 (65.3%). Of the respondents, 23.4% visited the park by other means of transportation than walking. This shows that not all senior park users consider distance as a barrier to access, as long as the destination is attractive, confirming that seniors would visit high-quality parks even when far from their homes [14,34]. In terms of time preference, 42.7% of interviewees choose 14:30–16:30, and 39.5% of interviewees choose 08:30–10:30. This is in line with on-site observations. The questionnaire results show that most seniors live with family members, regularly walk to the park alone, and they stay in the park for around two hours to do various activities. Mostly, urban seniors visit parks for rest and relaxation (77.4%), followed by physical exercise (66.9%); very few were passing through (2.4%) shown in Figure 3.

Figure 4 shows that the top landscape details in the park preferred by urban seniors are “tree shade (31.5%)”, “beautiful scenery (26.6%)”, “quiet (26.6%)”, “wide open (26.6%)”, “have seats (25.0%)”, “can observe others (22.6%)”, “close to the water (21.8%)”, “have sunshine (19.4%)”, “fitness equipment(15.3%)” and “lush vegetation(15.3%)”. No-one in the survey selected landscape details such as “artificial hills”, “no vegetation”, “people cannot see me”, “far from entrance/exit”. Certain seniors appreciated other spatial characteristics: shade provided by lush vegetation rather than structures; a wide, open space rather than an enclosed private space; spaces close to water bodies rather than far away; quiet spaces rather than noisy spaces, but quiet spaces can have some lively elements; and places where they can do physical exercise, observe others, be observed themselves.

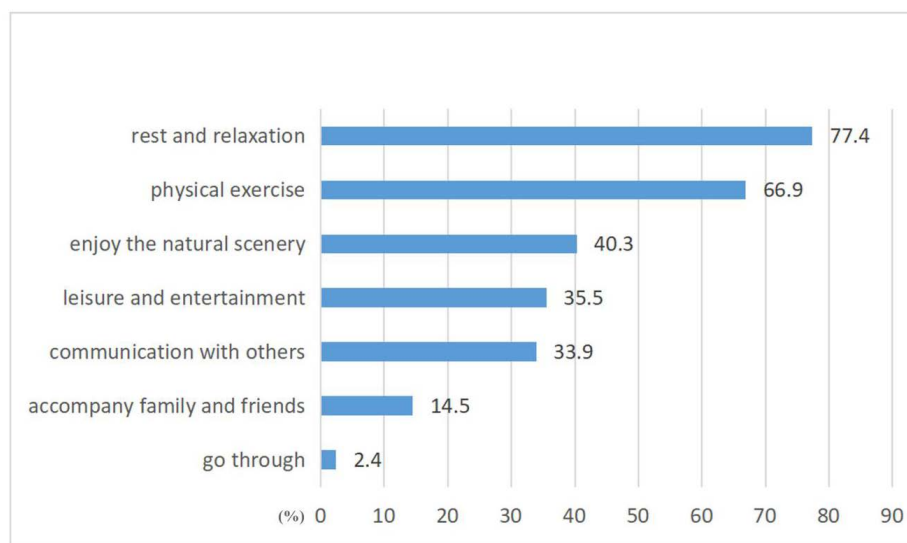


Figure 3. Reasons for visiting Lianhu park by urban seniors.

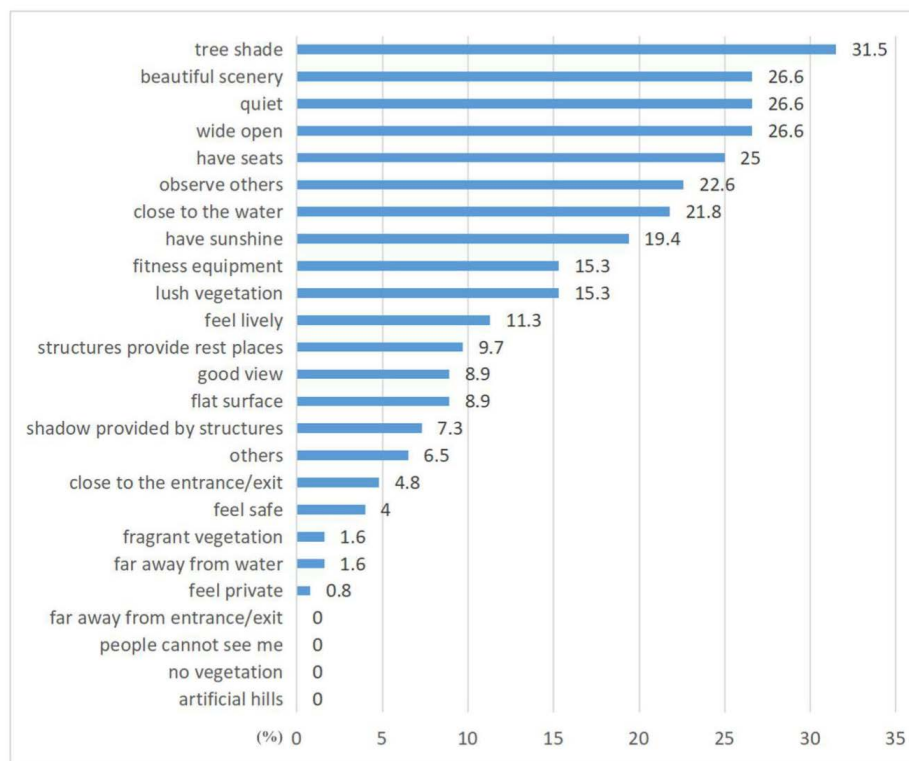


Figure 4. Landscape and spatial characteristic preference recorded by urban seniors in Lianhu Park.

Common complaints on the current development of Lianhu park made by urban seniors from the interview are: (i) 54.8% interviewees complained about the lack of available comfortable seats: the on-site observation corroborates this statement: many senior park users bring their own stools to the park; (ii) 34.7% interviewees complained about the noise caused by group activities: it was observed that when several small groups shared one square to perform their activities, their music collided. This affects each group using the space, and also impacts on people relaxing in the surrounding areas. These field dispute matters are also the common problems observed throughout most open spaces in China [35].

4. Discussion

The senior behavior patterns of park use are distinctive in China [31,32]. Huge numbers of urban seniors come to the park to relax, exercise, and socialize; this is uncommon elsewhere in the world (shown in Figure 3). Thus, to encourage more seniors to visit open spaces, age-friendly development in China should carry forward the advantages of existing comprehensive park design and avoid those landscape elements urban seniors find unattractive.

The time analysis has revealed that most seniors visit parks in two time periods daily: 8:30–10:30 and 14:30–16:30 (shown in Figure 1 and Table 1). Based on this finding, services associated with the enhancement of well-being, such as the advertisement on medical care, travel safety, and the benefit of active aging should be carried out in these two time periods to serve the largest number of urban seniors. Also, daily pick-up and drop-off buses can be arranged to serve urban seniors who live outside the walking radius of age-friendly outdoor spaces to ensure an easy access and departure around these two time periods. Finally, surrounding convenience facilities and services related to the daily life of urban seniors, such as market halls, should begin or continue to operate around the departure time of senior park users.

Analysis on places shown in Figure 5 has demonstrated the landscape preferences of Chinese urban seniors in comprehensive parks. Fitness squares (preferred landscape detail: fitness equipment), wide open squares (preferred landscape detail: wide open), water body (preferred landscape detail: close to the water), resting places next to the water body (preferred landscape detail: close to the water, have seats), and corridors (preferred landscape detail: have seats) are places senior park users prefer to be; rockery, private spaces and open squares close to the water body are places senior park users avoid. Along with the results concluded from the landscape preference analysis shown in Figure 4, functional zones of age-friendly outdoor spaces should incorporate these spacial characteristics: “fitness equipment”, “wide open”, “close to the water”, “have seats” and “quiet”. Functional zones bearing these spacial characteristics are highly appraised by urban seniors. Also, these landscape features are in accordance with the top reasons for going outdoors: rest and relaxation, and performing physical activities. Along with these specific identifications of functional zones, a successful age-friendly outdoor space must have beautiful scenery. A few landscape details are suggested here based on the landscape preference analysis shown in Figure 4. Sunshine is appreciated and shade is better provided by trees and lush vegetation rather than structures; quiet spaces are significantly more appreciated than noisy spaces, but quiet spaces may also have some lively elements; places with a good view where urban seniors can observe others and be observed by others are attractive to urban seniors, rather than private spaces where urban seniors cannot be seen by others; rest places are better designed close to the water rather than far away from the water; performance space is better designed close to the entrance/exit rather than far away from the entrance/exit; the design of a rockery must be avoided, as flat surface is much more appreciated; urban seniors are much more interested in beautiful scenery made up of ornamental plants rather than aromatic vegetation. To establish a successful age-friendly outdoor development that caters to the landscape preference of urban seniors, the findings above can serve as a guideline for design practitioners to map out design draft in the beginning stage of each project. Further research related to the detailed landscape spacial configuration of successful age-friendly outdoor spaces is required, and can be launched based on the preliminary findings presented in this paper.

Age-friendly outdoor development should consider individual and group activities, active and passive use of space and ensure the harmonious coexistence of quietness and liveliness to appeal to seniors interested in different activities. Interpreted from the activity analysis shown in Figure 2: (i) sufficient fitness equipment that is suitable for the physical condition of seniors should be planned to encourage physical exercises; (ii) sufficient sets of tables and seating should be planned in open squares to promote mind recreational table games; (iii) comparatively more chairs should be planned, and a well-designed chair is made of wood and has back support according to the feedback collected from the interview. (iv) sufficient open squares with various sizes should be planned to limit the field dispute

and guarantee the quality of individual resting activity and various entertaining group activities. The provision of sufficient and high-quality seating and open squares can not only support physical exercise, relaxation and entertainment, but also cultivate potential communication opportunities to gain stable social relationships for seniors through getting involved in various activities with others. Also, pleasing visiting experiences must be accompanied by the provision of sufficient basic facilities with frequent maintenance, such as drinking fountains, toilets and cafes [18–20].

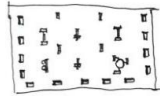
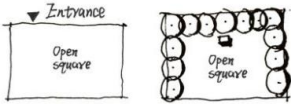
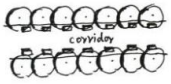
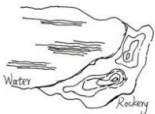
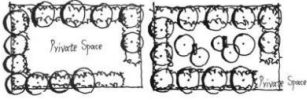
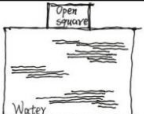
Places urban seniors prefer to be in study sites		
Place	Spatial Configuration Sketch	Place Characteristics
Fitness Square		-the most popular spot, very lively, flooded with visitors, seniors form a great percentage among the user groups -should be planned in a relatively large size -planning of fitness equipment, some tables and chairs are necessary -active individual activity is often associated with the fitness equipment on-site (in accordance with taking physical exercise as the aim to come to the park for some urban seniors) -passive activity is usually carried out in groups (playing poker, etc.)
Open Square		-wide open space -lively, even rambunctious -vary in sizes, but they are relatively large (one or more group activities would occupy the space) -often not far from the entrance -easily accessed visually and physically from the path (vegetation is planted along three sides of the square) -various sitting options are always provided in these squares along the edge or in the centre -Entrance square is often larger than other wide open squares in the park (it provides performance space for various group activities) -conflicts about unintentional trespassing and noise problem often occurs
Rest places next to the Waterbody		-peaceful -"beautiful scenery," "quiet," "have seats," "observe others," "close to the water": these features contribute to the heavy use of rest places next to the water -Individual and groups' long-lasting sitting activities occur here (occasional chatting may occur)
Corridors		-rest places, sitting is the most common activity here -can serve as "open squares", secondary performance space when designed squares are fully occupied -group activities attract other users to come and watch, but they block the path in a certain level and cause noise problems for seniors who choose to stay here for relaxing
Places urban elders avoid to be in study sites		
Rockery		-a common landscape element in Chinese urban parks -made of rocks, often located next to the water body -the size, shape, and height of the rockery is varied due to the size of the park -Rockeries in both study sites are about five meters high -urban seniors prefer places with a flat surface rather than places that require climbing (nature of the physical condition of seniors)
Private space		-a common landscape element in Chinese urban parks -secret places through planting lush vegetation along almost all edges of a square, leaving an inconspicuous entrance -sometimes spaces inside would further be broken into several mini-spaces by vegetation -respects the privacy of individuals -Chinese urban seniors tend to neglect the issue of privacy, instead they prefer spaces which are wide open
Open square close to the water		-seniors prefer to be close to water, but they dislike doing exercises next to the water body (water body is generally associated with passive activities such as sitting, whereas an open space normally serves as a stage for active group activities) -two entirely opposite space features collide with each other

Figure 5. Places urban seniors prefer and avoid being in study sites.

Places and activities are interrelated. It is shown in Figure 2 that particular places support certain activities. It is suggested that in the beginning stages of an age-friendly outdoor development, the desired activity types of senior users must be studied as people are the core of a space. Activities recorded in Figure 2 can serve as a reference guide to help forming surveys for collecting data on potential senior users' preferred activities. Then, necessary functional zones with distinct spacial features shown in Figure 5 can be designed according to the data collected through surveys to support preferred activities. Detailed landscape preferences and preferred activity facilities shown in Figure 4 should be designed within the functional zones to enhance the outdoor experience of seniors. In order to improve the engagement between senior users and the outdoor environment, additional functional zones associated with seniors' preferred landscape features that offer innovative activities can be introduced to promote active aging as well. Various combinations of functional zones and detailed landscape preferences can be generated by design practitioners according to particular locations, sizes and uses of outdoor spaces. Further studies on the appropriate proportions of desired landscape features are required to reach the best outcomes.

At the heart of all field disputes, including the lack of comfortable seats and noise issues observed on the study site, is the lack of high-quality open spaces in China. According to the State Forestry Bureau (2017) [36], parkland green space per inhabitant value in China is 13.5 square meters. However, comparing to the median value of parkland per 1000 residents in USA, which is 13.1 acres (about 53.0 square meters per inhabitant) [37], more public parkland is required in China to serve urban dwellers better, especially considering the rapidly aging population. If nothing is done, conflicts about the right to equally appropriate limited high-quality open spaces between different social groups, such as fighting for the use of limited comfortable seats and favorable performance areas, will still exist and may even accelerate in the near future [35]. As China is an aging society, high-quality outdoor spaces, designed exclusively for seniors are needed urgently to mitigate existing conflicts. From the above analysis on behavior patterns and landscape preferences of urban seniors, some initial design guidelines can be drawn to serve the age-friendly outdoor development in the future.

This paper presents behavior patterns and landscape preferences of Chinese urban seniors as an initial guideline that is able to launch further theoretical investigations and practical design breakthroughs on age-friendly outdoor development. This investigation conducted in spring, Xi'an alone can be supplemented by collecting supporting data in other cities and seasons to generate a national standard of age-friendly outdoor development. Furthermore, findings from this research can only be used as a reference when discussing the global scenario. More research on related topics is needed worldwide for establishing a well-acknowledged design guideline to better serve the increasing aging population.

5. Conclusions

The results of behavior patterns and landscape preferences focused on time, place and activities extend the previous findings and offer new insights to the ongoing discussion of age-friendly outdoor development. The knowledge presented here is particularly constructive for Chinese landscape architects and urban planners to (i) launch further theoretical investigations on age-friendly outdoor spaces from new perspectives; (ii) upgrade the existing urban parks with age-friendly designs; and (iii) design new, successful age-friendly outdoor spaces using guidelines provided here as a reference.

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Conflicts of Interest: The authors declare no conflict of interest.

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