

HOW DESIGN INFLUENCES OLDER ADULTS' OUTDOOR SPACE USAGE AND  
SATISFACTION  
A CASE STUDY OF OUTDOOR ENVIRONMENTS IN CHINESE FACILITIES FOR  
THE ELDERLY

A Dissertation

by

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## **ABSTRACT**

Along with the rapidly increasing Chinese elderly population, the demand for sound practices that improve elderly people's health and well-being in Chinese long-term care facilities grows synchronously. Spending time in outdoor spaces positively influences senior adults' physical and psychological health. The design of outdoor spaces in senior living facilities has an important impact on elderly people's use of outdoor spaces and their satisfaction. It is suggested that physical environment should support users' needs from five domains, including accessing to nature, outdoor comfort and safety, walking and outdoor activities, indoor-outdoor connection, and connection to the world. Although many published research supported this theory, most of these studies were conducted in long-term care facilities in western countries. More specifically, there is limited research written in English that examines whether this theory is applicable in a different cultural context, such as China.

This study examined whether environmental features in these five domains influence senior adults' outdoor space usage and their satisfaction in a Chinese context. An exploratory case study was conducted in two Chinese long-term care facilities, Huishan Elderly Home (HEH), and Nanshan Charity Home (NCH). Both facilities located in Wuxi, China, and have more than 300 residents. Three outdoor spaces in each facility were studied. A triangulation approach was applied to collect data, which is composed of both qualitative and quantitative methods. Data collection methods included environmental audit, behavior mapping, focus group, and survey.

The research findings contributed in three aspects. First, it uses qualitative methods (focused group and open-ended questions in the questionnaire) to show Chinese cultural preferences for outdoor features in Chinese long-term care facilities. Second, it uses qualitative methods (focus groups and open-ended questions in the questionnaire) to modify the Seniors' Outdoor Survey (SOS tool) for Chinese long-term care facilities. Third, it finds a descriptive correlation between SOS findings and resident satisfaction.

## **DEDICATION**

For my parents, Jianhua and Jinhua

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All work for the dissertation was completed independently by the student.

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# **1. INTRODUCTION OF ISSUES OF AGING**

## **1.1 Background**

In the early 21<sup>st</sup> century, as Chinese baby boomers began to reach retirement age, the number of older adults grew rapidly in China. According to a report from the National Bureau of Statistics of China, more than 150 million persons were 65 and older in 2016, accounting for 10.8% of the population(NBSC, 2017). Because most families in urban areas of China have been single-child families since 1970s, the birth rates quickly dropped. On the other hand, due to the development of the economy and medical advances, people are living longer. As a result, the increase of senior citizens, and reduced numbers of their children, the availability of day-to-day care for senior adults from their children is decreasing (Cheng et al., 2011). With the development of options for seniors in China, living in retirement communities becomes an alternative choice for elderly care. Evidence shows that an increasing number of elderly people in China choose to live in retirement communities after their retirement (Zhan, Liu, & Bai, 2005). Therefore, identifying sound practices that improve elderly people's health and well-being in these facilities is needed.

## **1.2 Demographics Trends in China**

According to the data reported by National Bureau of Statistics of China (NBSC), there are 119 million senior adults in 2010, accounting 8.9% of the whole population. As shown in Figure 1.1, the number of national senior adults kept growing in the past 7 years at a rate of around 10% a year (NBSC, 2017). In 2016, the census data

shows more than 150 million persons were 65 and over in 2016, accounting for 10.8% of the total population (NBSC, 2017). China National Committee on Aging (CNCA, 2018) forecasts that the elderly population will be around 470 million, accounting for approximately 30% of the total population by the middle of this century. Due to the rapidly increasing population of senior adults in China, the demands for high-quality long-term facilities will grow substantially.

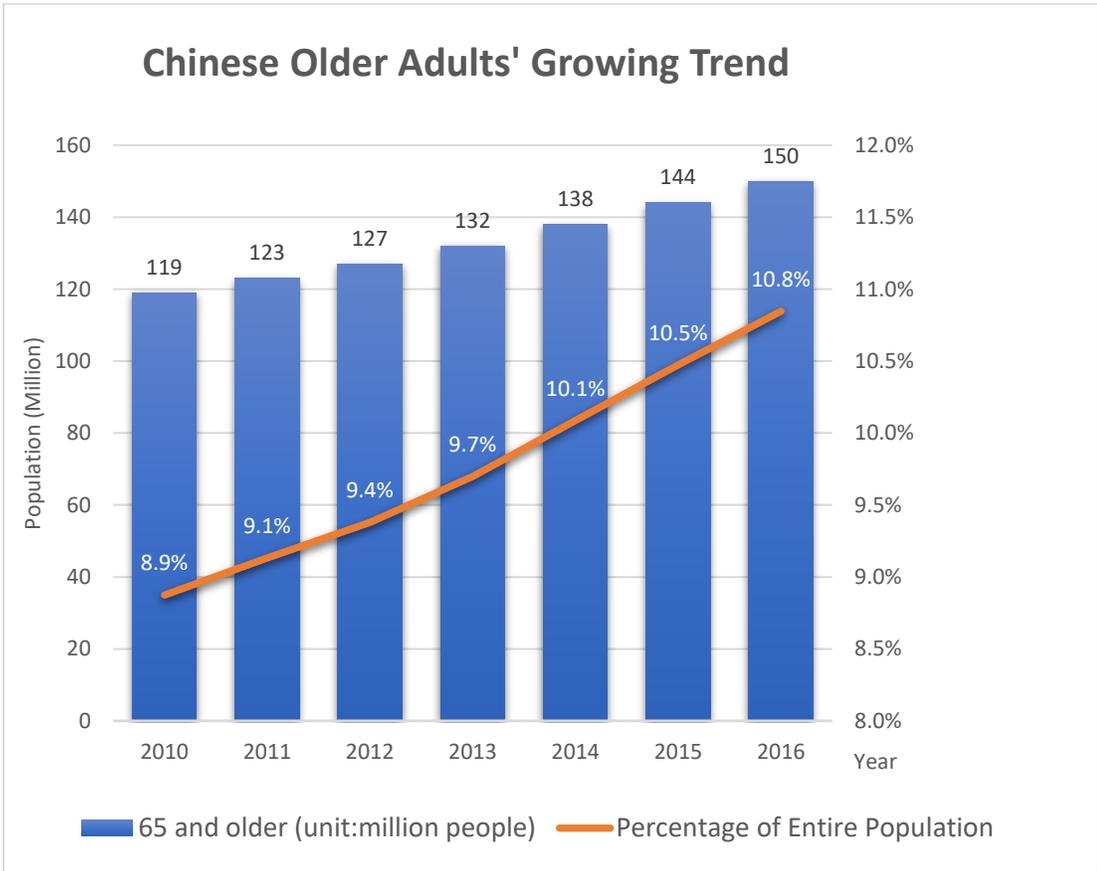


Figure 1.1 Number and Percentages of Persons Age 65 and Over in China 2010-2016 (NBSC, 2017)

### **1.3 Significance of this Study**

This study aims to examine environmental features in five domains, including accessing to nature, outdoor comfort and safety, walking and outdoor activities, indoor-outdoor connection, and connection to the world (Rodiek, Nejati, Bardenhagen, Lee, & Senes, 2014) influence senior adults' outdoor space usage and their satisfaction in a Chinese context by conducting an exploratory case study in two Chinese facilities for the elderly. The importance of the potential contribution of this study comes from three aspects.

First, it will add a Chinese cultural context in the existing theory. By conducting an exploratory case study in Chinese facilities for elderly, evaluating the applicable range of the theory that well-developed environmental features in five domains improve senior adults' outdoor space usage and satisfaction extend into the context of China.

Second, it is anticipated to show what and why design features are preferred or not preferred in outdoor spaces of Chinese facilities for the elderly. The exploration of what and why some features are important for outdoor of usage can help designers and researchers to understand both superficial and in-depth knowledge of how to choose proper features and how to arrange them to satisfy users' needs.

Third, a set of design guidelines will be developed based on research findings to help further outdoor space design in Chinese long-term care facilities. Due to the rapidly increasing elderly population, the demand for sound practices that improve elderly people's health and well-being in Chinese long-term care facilities grows synchronously. However, design guidelines for Chinese facilities for the elderly derived from empirical

evidence is limited. This study will develop design guidelines based on an exploratory case study with a rigorous methodology and will help the further outdoor space design to meet the standards of evidence-based design.

## **2. REVIEW OF LITERATURE OF ENVIRONMENTAL ASSOCIATIONS WITH HEALTH**

### **2.1 Benefits of Spending Time Outdoors**

Spending time outdoors can lead to several positive health outcomes, including increased physical activity, improved Vitamin D absorption, lower heart rate and blood pressure, reduction in negative mood level, recovering from fatigue and stress, and increased longevity (Godbey & Blazey, 1983; Holick, 1995; Humpel, Owen, & Leslie, 2002; Netz, Wu, Becker, & Tenenbaum, 2005; Takano, Nakamura, & Watanabe, 2002; Rodiek, 2002, Tang & Brown, 2006, Ottosson & Grahn, 2006). Additionally, it can bring some economic benefits. A study showed better outdoor environments can lead to cost benefits in facilities for the elderly through increased word-of-mouth referrals (Rodiek, Boggess, Lee, Booth & Morris, 2013).

### **2.2 Environmental Psychology**

Literature from the field of environmental psychology explains why some environmental features are important to elderly people from the psychological perspective and inform environmental designs.

Ulrich's (1999) Theory of Supportive Gardens underlined the importance of stress reduction and the positive health outcomes associated with it. In his theory, he suggested reducing stress from four major perspectives in a healing space. They include: 1) Sense of control; 2) Social support; 3) Physical movement and exercises; and 4) Natural distractions (Ulrich, 1999).

Appleton's (1996) Prospect-Refuge Theory proposed environmental aesthetics with the interaction between human beings' perceptions and natural environments on the basis of evolutionary theory (Mealey & Theis, 1995). He suggested people might like a place if it allows them to see open views (prospect), but not been seen and provide protections (refuge) (Appleton, 1996).

Rodiek et al. (2014) published an environmental audit study using the Seniors' Outdoor Survey (SOS), which suggested a successful outdoor healing environment in a long-term care facility should have design features from five domains: 1) access to nature; 2) outdoor comfort and safety; 3) walking and outdoor activities; 4) Indoor—outdoor connection; and 5) connection to the world. Design features in the five domains of SOS tool comprehensively represent the important features in attracting elderly people to use outdoor spaces (Rodiek, Nejati, Bardenhagen, Lee, & Senes, 2014).

## **2.3 Environmental Features**

A great body of previous literature supports the importance of design features which attract older adults to use outdoor space in the five domains. This literature is organized and categorized into three parts: preferences, outcomes, and design recommendations.

### **2.3.1 Access to Nature**

Providing natural elements for elderly residents to observe and manipulate as a positive distraction and sensory stimulation would increase outdoor usage (McBride, 1999; Rodiek, Nejati, Bardenhagen & Senes, 2014). An observation study showed

access to nature is one of the major patterns of outdoor usage in long-term care facilities (Kearney & Winterbottom, 2005). And the preferences of contact with nature may increase with aging (Dunnett & Qasim, 2000).

Studies have shown that access to nature may improve both physical and physiological health. Exposure to nature has been shown to reduce stress (Ulrich, 1979; Verderber, 1986; & Bell et al., 2001, Rodiek, 2002), pain (Kline, 2009), muscle tension, skin conductance, heart rate (Ulrich, 1979), help in rehabilitation, healing, social interaction and sensory stimulation (Söderback, Söderström, & Schäländer, 2004), and improved quality of life (Sugiyama and Thompson, 2007) .

Design Recommendations suggested that outdoor spaces in long-term care facilities supporting access to nature should have several features such as, abundant greenery, flowers and color, reachable plants, interesting views, and animals (Rodiek, Nejati, Bardenhagen, Lee, & Senes, 2014; Rodiek, 2005; Cooper Marcus & Barnes, 1999; McBride, 1999; Hendy, 1987). It was also recommended that all vegetation as nontoxic and an outdoor space might have a ratio of 70% vegetation that proves contrast of light and dark, varying in plant size, recognizable themes, and seasonal highlights (Cooper Marcus & Barnes, 1999).

### **2.3.2 Outdoor Comfort and Safety**

Outdoor comfort and safety are among the most important environmental features that affect elderly adults' choices of whether to use outdoor spaces (Stoneham & Jones, 1997; Talbot & Kaplan, 1991). Research shows outdoor spaces that provide a choice of comfortable sitting areas with appealing views can increase outdoor spaces

usage (Rodiek & Lee, 2009). A safe and comfortable outdoor space may lead several psychosocial benefits to elderly adults, such as increasing perceived safety and security, perceived comfort, sense of control and choices, and willingness to participate in socialization (Rodiek, Lee, & Nejati, 2014; McBride, 1999; Cooper Marcus & Barnes, 1999).

Design recommendations suggested outdoor spaces in long-term care facilities that support outdoor comfort and safety should include several design features. These features may include choices of comfortable sitting areas with appealing views, structures or trees to provide shade, accessible restrooms, stable tables, nearby drinking water, good air quality, microclimate control, and good maintenance (Rodiek, Nejati, Bardenhagen, Lee, & Senes, 2014; McBride, 1999; Cooper Marcus & Sachs, 2014). It was further suggested that choices of seating options (such as in sun or shade), proper configuration (such as right-angled, U-shaped seating, or moveable chairs that allow a small group of people to chat), and amenities (such as rocking chairs, porch swing, and gliders) can increase the space usage. (McBride, 1999; Cooper Marcus and Francis, 1997; Cooper Marcus & Sachs 2013; and Regnier, 1985) Additionally, comfortable seats with arms, backs, and cushion could be welcomed by elderly people (Rodiek, Lee, & Nejati, 2014; Brienza & Karg, 1998; Finlay et al., 1983).

### **2.3.3 Walking and Outdoor Activities**

Walking and other mild forms of exercise are two of the most common patterns of outdoor usage among elderly people in facilities for the elderly (Ulrich, 1999;

Kearney & Winterbottom, 2005). It was reported that about 22% of the senior residents used outdoor spaces for these activities (Cranz, 1987).

It is believed that facilitating regular walking and other mild forms of exercise is extremely important to support long-term restoration benefits among senior adults in long-term care facilities (Ulrich, 1999). Studies showed that conducting physical activities, even extremely mild activities, could improve physical and psychological well-being for elderly people. The benefits might include forestalling the risk of decreased mobility, social isolation, and passivity (Cooper Marcus & Barnes 1999; McBride, 1999); preventing pressure ulcers, flexion contractures, and nerve paralysis (Hartigan, 1982); and guarding against deterioration in the elderly adults' ability to conduct basic daily living activities, such as putting on clothes, and going to bathroom without assistance (Richman, 1968).

Design Recommendations suggested outdoor spaces in long-term care facilities that support walking and outdoor activities should include many design elements. These might include looping walkways, safe paving, comfortable walkways, a frequency of walkway seating, attractive focal elements, proper design details (such as handrails, steps, and ramps), and opportunities for social interaction and exercise (Rodiek, Nejati, Bardenhagen, Lee, & Senes, 2014; Cooper Marcus & Sachs, 2014; McBride, 1999; Ulrich, 1999). Additionally, built features (e.g. routes of varying lengths and difficulty), destinations (such as gazebos and pavilions with interesting views), and places for games (such as mini-golf course, outdoor poker tables, and ball courts) could encourage elderly

people and become more active in both exercise and social interactions (McBride, 1999).

#### **2.3.4 Indoor-outdoor Connection**

Transitional seating areas between indoor and outdoor are very important in long-term care facilities allowing people to take a seat and observe outdoors environments (Marcus & Sachs, 2014). Additionally, many elderly residents use the transition areas and windows next to outdoor spaces to preview weather and outdoor usage before they decide to go outside (Carstens, 1993; Rodiek & Fried, 2005). A good indoor-outdoor connection can increase accessibility and encourage elderly people to use the outdoor spaces (Rodiek, Lee, & Nejati, 2014).

Studies showed even merely viewing a natural landscape through a window or doorway can bring physical benefits, such as reduced blood pressures, and heart rates (Tang & Brown, 2006; Ulrich, 1984). A transition area between indoor and outdoor space can provide an opportunity for elderly people's eye to adjust to strong light from the outside before they enter outdoor areas (Hatton, 1977). It can decrease in anxiety and stress applying "prospect-refuge" (Appleton, 1996); and improve elderly people's physical security due to the capability of being monitored by staff (Marcus & Sachs, 2013). Conversely, if doors fail to be opened safely and easily, senior users might experience a decreased sense of control, security, dependency, and satisfaction, and at the same time to experience an increased feeling of helplessness and alienation (Regnier & Pynoos, 1992; Schwarz & Brent, 1999).

Design Recommendations suggested outdoor spaces in long-term care facilities that support indoor-outdoor connection should include important design features such as visibility, alternate entrances, comfortable transition zone with seating, large windows in transitions areas. Barriers caused by doors and thresholds shall be minimized by addressing problems from poor opening/closing, thresholds, and landings, and self-locking (Rodiek, Nejati, Bardenhagen, Lee, & Senes, 2014; Cooper Marcus & Sachs, 2014; McBride, 1999). Automatic doors are highly recommended for its safety and convenience to open, especially for those using wheelchairs, having impairments of the hand, wrist, and arm, and having other problems causing difficult opening traditional doors (Rodiek., Lee, & Nejati, 2014; McBride, 1999; Cooper Marcus & Sachs, 2014).

### **2.3.5 Connection to the World**

Entry gardens with patio/transition spaces are observed to be the most popular spaces in long-term care facilities, where “elderly people congregate to sit and watch the activity at the entrance to the home” (McBride, 1999, p 401). Cranz (1987) found an extremely high preference of elderly people in long-term care facilities to view the passing people and vehicles on the street.

Offering residents in long-care facilities the chance to observe and interactive with outside world can lead to both physical and psychological benefits, including psychological benefits of effectively reducing stress, loneliness, sense of dependency, and isolation (Hendy, 1987; Ulrich,1979; Verderber, 1986; Bell et al., 2001), and physiological benefits of lower blood pressures, and heart rates (Tang & Brown, 2006; Ulrich, 1984). Additionally, an entry garden could improve the image of the facility,

helping it to integrate into the neighborhood, separating the home from the road, providing seating and shade for residents entering or leaving facilities (McBride, 1999).

Design Recommendations for outdoor spaces in long-term care facilities should have design features to support connection to the outside world. These features might include front porch/ entry garden with sufficient shade, large enough to accommodate different groups of people in different activities, provide sufficient tables and chairs for large and small groups, and provide opportunities to watch passing people, vehicles, landscape features, and nearby surroundings (Rodiek, Nejati, Bardenhagen, Lee, & Senes, 2014; Cooper Marcus & Sachs, 2014).

## **2.4 Research Gap**

A considerable body of published research and design recommendations suggested that outdoor space usage and users' satisfaction can be improved by well-developed environmental features from five domains, including access to nature, outdoor comfort and safety, walking and outdoor activities, indoor-outdoor connection, and connection to the world (Rodiek, Nejati, Bardenhagen, Lee, & Senes, 2014; Cooper Marcus & Sachs, 2014; McBride, 1999; Hendy, 1987; Ulrich, 1979; Verderber, 1986; & Bell et al., 2001; Craz, 1987; Carstens, 1993; Rodiek & Fried, 2005). This theory is thought to be widely applicable in a range of long-term care facilities (Rodiek, Nejati, Bardenhagen, Lee, & Senes, 2014). Although much-published research supports this theory, most of these studies were conducted in long-term care facilities in western countries (see Appendix A). More specifically, there is an identified lack of published

research written in English to examine whether this theory is universally applicable in a cross-cultural context, like China.

## 2.5 Research Questions

This research contains five research questions to explore the relationship between scores evaluated by SOS tool in five domains of the environmental features and outdoor space usage, and the relationship between these scores and satisfaction survey results.

The research Questions include:

Q1. Will an outdoor area having a higher SOS score in the domain of ***access to nature*** (including abundant greenery, flowers and color, reachable plants, interesting views and animals) be used more and have higher satisfaction survey results?

Q2. Will an outdoor area having a higher SOS score in the domain of ***outdoor comfort and safety*** (including a choice of comfortable sitting areas with appealing views, available restrooms, good air quality, and good maintenance) be used more and have higher satisfaction survey results?

Q3. Will an outdoor area having a higher SOS score in the domain of ***walking and outdoor activities*** (include looping walkways, safe paving, comfortable walkways, a

*frequency of walkway seating, attractions, and opportunities for social interaction and exercises*) be used more and have higher satisfaction survey results?

Q4. Will an outdoor area having a higher SOS score in the domain of ***indoor-outdoor connection*** (*including visibility, alternate entrances, comfortable transition zone, and with minimized barriers from doors and thresholds*) be used more and have higher satisfaction survey results?

Q5. Will an outdoor area having a higher SOS score in the domain of ***connection to the world*** (*including front porch/ entry garden, and providing opportunities to watch passing people, vehicles, landscape features, and nearby surroundings*) be used more and have higher satisfaction survey results?

## **2.6 Scope of Project**

The quality of outdoor environmental features and design layouts are influential to elderly people's outdoor usage and users' satisfaction. This research aims to explore the relationship between them and develop design recommendations for outdoor spaces in long-term care facilities. There are three major aims included in this research, which are listed as follow.

### **Aim 1: Identify Important Environmental Features**

Conduct case study research by applying environmental audit, behavior mapping, and survey to test which environmental features most effectively support outdoor usage in Chinese facilities for the elderly.

### **Aim 2: Identify Patterns of Use**

Conduct exploratory behavior mapping research to graphically identify where use is taking place. Participants' momentary location will be recorded along with several attributes, including gender, mobility level, physical activity level, and identity. The qualitative relationship between a use location and these attributes will be analyzed to discover patterns of use in outdoor spaces of Chinese facilities for the elderly.

### **Aim 3: Develop Design Recommendations**

Develop design guidelines of physical environmental features and layouts to increase outdoor space usage and users' satisfaction for future design.

### 3. METHODOLOGY

#### 3.1 Research Design

The research uses a case study design by applying a multi-method approach. In this study, there are four different data collection methods: 1) environmental inventory, 2) empirical behavior mapping, 3) questionnaire and 4) qualitative interview (focus group). The conceptual framework is shown in Figure 3.1. And variables are shown in Table 3.1.

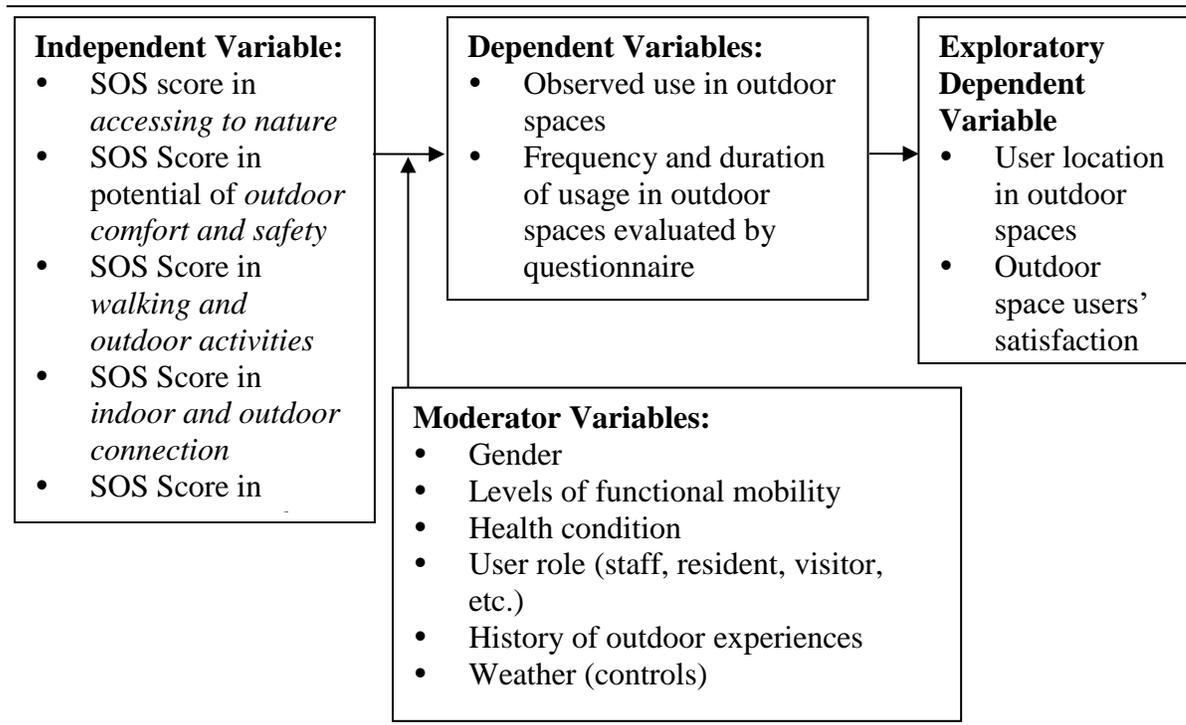


Figure 3.1 Conceptual Framework

Table 3.1 Research Variable Structure

	Variables	Measures
Independent Variable	Scores of accessing to nature	Scores evaluated by SOS Instrument
	Scores of outdoor comfort and safety	
	Scores of walking and outdoor activities	
	Scores of potentials of indoor and outdoor connection	
	Scores of connections to the world	
Dependent Variable	Observed use in Outdoor Spaces	Observed number of people using the outdoor spaces. By Gender, levels of functional mobility, user role, physical activity level (sedentary, moderate, vigorous)
	Weekly frequency and duration of usage in outdoor spaces	Scores evaluated by questionnaire
	Satisfaction survey results	Quantitative results from close-ended questions, and qualitative results from open-ended survey questions
Moderator Variable	Gender	Grouping: male, female
	Levels of Functional Mobility	Grouping: walking with no aid, walking with mild aid, walking with seated aid
	Use role	Grouping: resident, staff, visitor
	Health condition	Evaluated by Survey
	History outdoor experience	
Exploratory Dependent Variable	User Location	Graphically located in outdoor spaces by behavior mapping
	Users' Satisfaction	Evaluated by Survey

### 3.2 Selection Criteria for Facilities

Criteria for facilities selection will be based on relevant factors, including:

a) licensed facilities for the elderly in Wuxi, China, having a desirable outdoor climate

b) facilities are built after 2000

c) facilities have more than 100 elderly residents

d) facilities within a one-hour driving distance of downtown

e) facilities have more than one well-developed open space, within 10 minutes' walk of the buildings

Wuxi is the third largest city in Jiangsu Province, China. It is a well-developed city with desirable outdoor climate. Within the city, two facilities were selected based on the above selection criteria from the list of 85 licensed facilities for the elderly. The selection criteria were defined based on some dominant criteria. First, the study targeted relatively new facilities because their campuses were usually better designed and of similar construction compared the older ones built before 2000. Second, the study facilities should have at least a certain number of residents (more than 100) to give a large enough sample size. Third, the facilities should be within a one-hour driving distance from downtown to allow the researcher to commute daily. Fourth, the facilities should have more than one well-developed space, which enables comparison between spaces within the same facility. Additionally, these spaces should be within 10 minutes' walk from the buildings because these walkable outdoor spaces are more likely to be used by residents. The sampling procedure is shown in Figure 3.2.

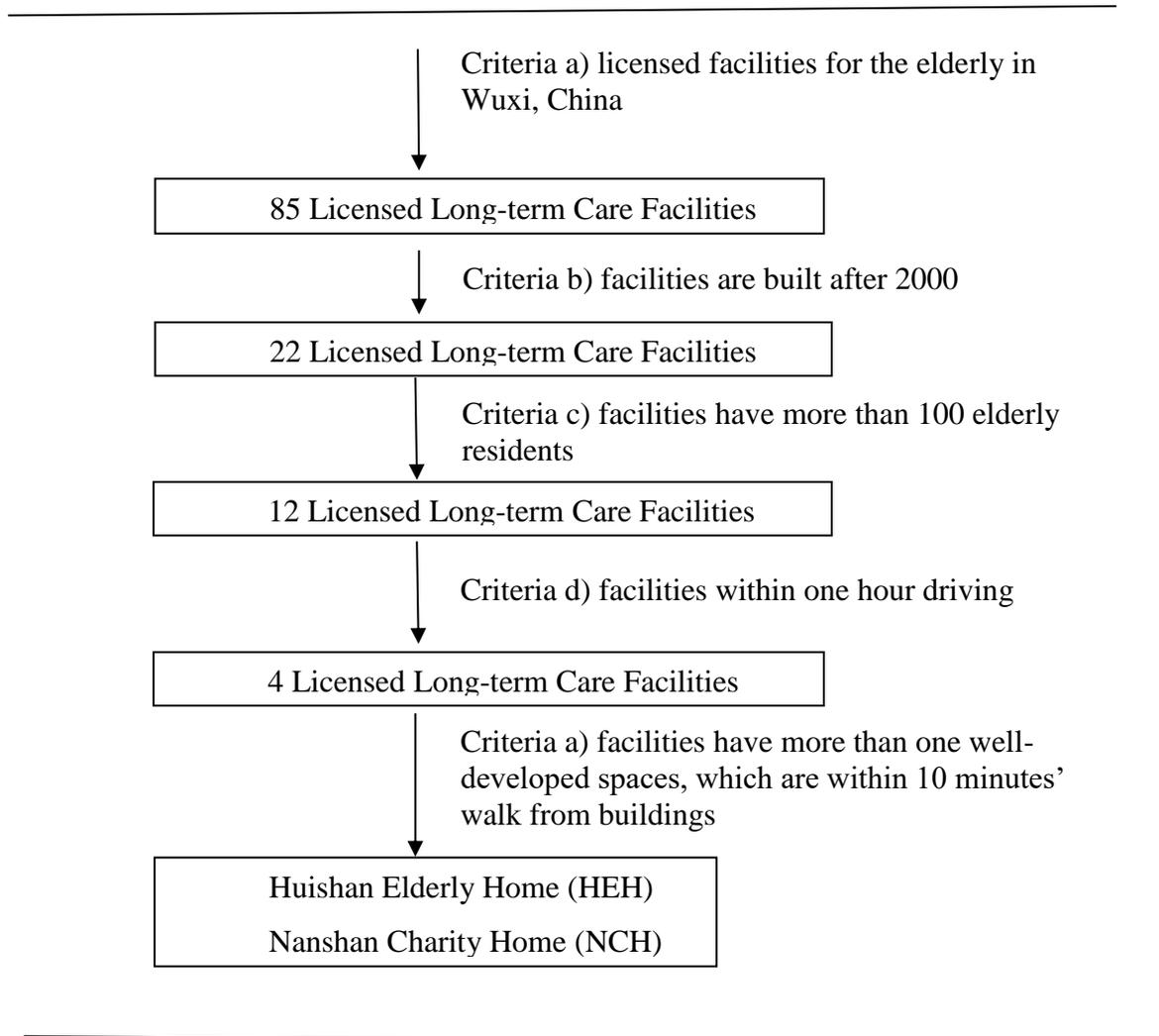


Figure 3.2 Facility Sampling Procedure

### 3.3 Setting

Both of the selected facilities are located in Wuxi, China. Wuxi is a city in Jiangsu Province with a population of 2.4 million, and 16.8% of people are at or over 60 in 2017 (Wuxi Gov., 2017). Wuxi is located in the southeast China, which has a mild

climate, with an average annual temperature being 64°F, which is attractive for outdoor activities.

Table 3.2 Summary of Facilities

Facility Name	Huishan Elderly Home (HEH)	Nanshan Charity Home (NCH)
Location	Wuxi, China	Wuxi, China
Year Open	2009	2012
Area (Acre)	8	10.6
Maximum Capacity	500	500
Residents Population	307	269
Age Range	55-98	62-103
Mean Age	72	84
<b>Sex</b>		
1. Male Residents	260	10
2. Female Residents	47	163
<b>Level of Health Care</b>		
1. Independent Living	170	6
2. Assisted Living	96	117
3. Skilled Nursing	41	146
<b>Employee Population</b>		
1. Staffs	99	60
2. Administrators	10	10

According to reports from the three communities, some basic statistics are shown in Table 3.2. Huishan Elderly Home (HEH) was built in 2009, and it occupies 8 acres. It is about 40 minutes' driving distance from downtown Wuxi. Until 2016 Summer, there were 307 elderly people living in the facility, taking about 61% occupancy. The

resident's age ranged from 55-98, and the mean age was 72. There were 206 males and 47 females. Of the residents, 170 were in independent living (the facility provided three meals, room clean, and laundry service), 96 residents were in assisted living, and 41 residents were in skilled nursing. The employee population was 109. Among them 99 were staff, and 10 were administrators.

Nanshan Charity Home (NCH) was built in 2012, and it occupies 10.6 acres. It is about 25 minutes' driving distance from downtown Wuxi. Until 2016 Summer, there were 269 elderly people are living in the facility, making about 54% occupancy. The resident's age ranged from 62-103, and the mean age was 84. There were 106 males and 163 females. Six residents were in independent living (the facility provided three meals, room cleaning, and laundry service), 117 residents were assisted living, and 146 residents were skilled nursing. The employee population was 70. Among them 60 were staff, and 10 were administrators.

Huishan Elderly Home is made up of three major outdoor spaces, Space A, B and C, the main administration building, a gym, five residential buildings, and one dining hall at the back. The three outdoor spaces, Space A, B, and C, of Huishan Elderly Home (HEH), will be studied in this research. Space A is a spacious outdoor space with a pond, Space B is an entry garden, and Space C is an outdoor space with an umbrella plaza. The layout of Huishan Elderly Home is shown in Figure 3.3.

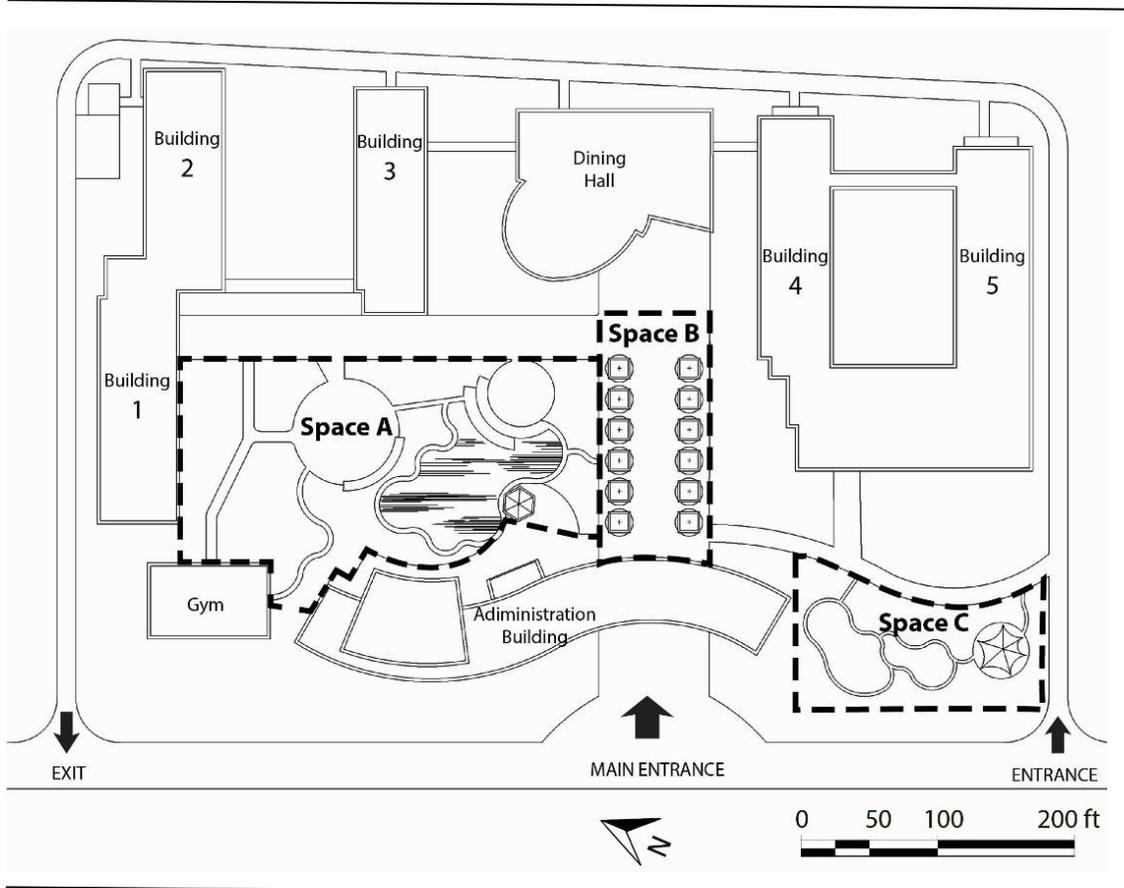


Figure 3.3 Layout of Huishan Elderly Home (HEH)

Nanshan Charity Home also has three major open spaces, four residential buildings, one administration building, and one clinic building. One driving loop connects the building and outdoor spaces. The north of the facility is a major driving road, and the west of the facility is a river. Space D is the entry garden, Space E is an outdoor gym adjacent to the river and Space F is a central garden between Building II and Building III. The three outdoor spaces, Space D, E, and F, of Nanshan Charity Home (NCH), will be studied in this research. The layout of Nanshan Charity Home is shown in Figure 3.4.

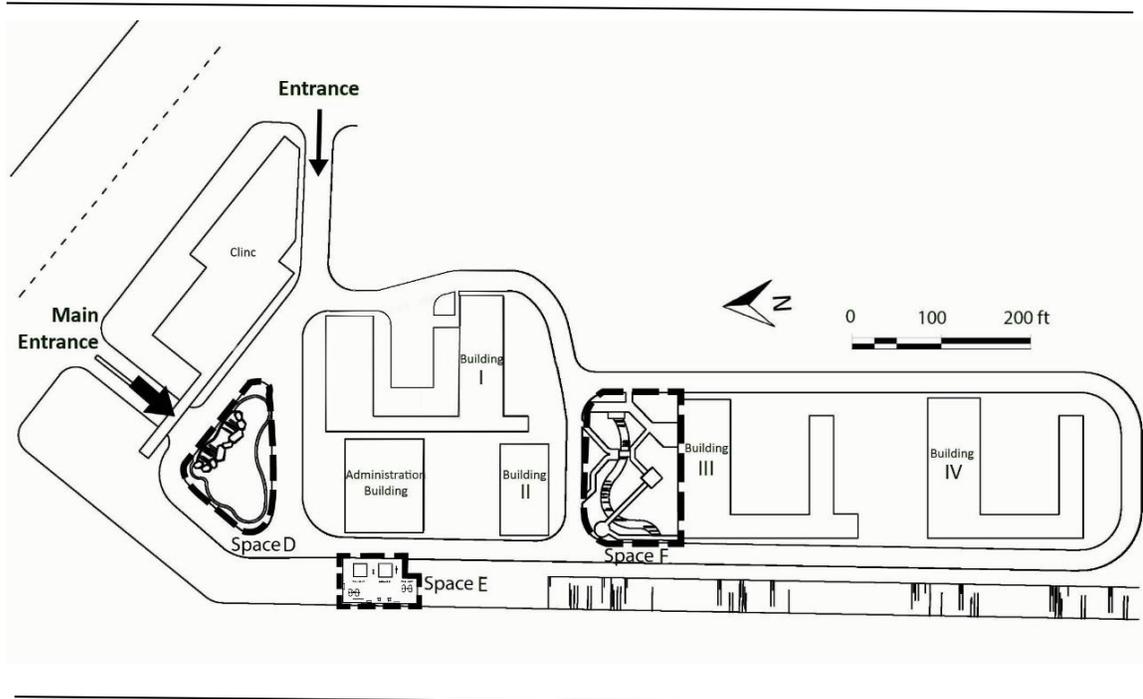


Figure 3.4 Layout of Nanshan Charity Home (NCH)

### 3.4 Populations

The research population of this study will be staff and residents of both the independent living and assisted living sections of Huishan Elderly Home (HEH); and Nanshan Charity Home (NCH). Residents who need skilled nursing were excluded in this research study because naturally they rarely use the outdoor spaces. The total survey population would be 568 from both facilities. Among them were 266 elderly residents and 109 staff from HEH, and 123 elderly residents and 70 staff from NCH. Table 3.3 presents the distribution of the population.

Table 3.3 Population of the Research Study

Data Collection Method	Huishan Elderly Home (HEH)		Nanshan Charity Home (NCH)	
	Resident	Staff	Resident	Staff
Behavior Mapping	307	109	269	60
Questionnaire	266	109	123	60
Focus Group Interview	12	12	14	12
Individual Face-to-face Interview	10	0	10	0

### 3.5 Sampling of Participants

The research sampling strategy for selecting residents was based on residents' ability to access and use to outdoor spaces. The population of the survey must be both cognitively intact and physically mobile with or without aids. The staff of Huishan Elderly Home (HEH), and Nanshan Charity Home (NCH) screened the appropriate survey population. Additionally, these were 12-14 voluntary residents who were both cognitively intact and physically mobile with or without aids, from each facility who were invited to participate in focus group discussions. Residents who were using the outdoor spaces in each facility were randomly selected and invited to participate in individual face-to-face interviews. Behavior mapping indoor spaces included all residents.

The population of the staff survey covered the entire population of employees. Additionally, 12 voluntary employees from each facility were invited to participate in focus group discussions.

### **3.6 Methods of Data Collection**

#### **3.6.1 Multi-method Approach (Triangulation Approach)**

In this study, a triangulation approach is applied to collect data, which is composed of both qualitative and quantitative methods. The purpose of applying a triangulation using 3 different data sources for a multi-method or mixed-method research approach is to increase the validity and reliability of the research findings (Sommer & Sommer, 2002). After considering each method's strength, weakness, and relevance, researchers can take advantage of one method's strength to strengthen the shortcoming of the other methods and examine the accuracy of findings obtained by other methods. By applying a triangulation approach, the researcher can gain more holistic results from using multiple methods in research to increase their confidence in interpreting the findings.

Many researchers applied a multi-method approach in studies which related to the built environment. They explore when, where, how, and why people use the built environment in certain ways. Cutler (2000) believes that data for environmental assessment should come from different sources, "including observation, behavior mapping, traces, floor plans, questionnaires, interviews, and focus group" (p.378).

In this research study, several research methods are applied including environmental audit, behavior mapping, questionnaire, focus group interview and data analysis. The detailed phases of the research study are shown in Table 3.4.

Table 3.4 Phases of Research Study

Research Phase Name	Method of Data Collection/Analysis	Study Population
Environmental Audit	1. Use SOS tool to audit outdoor space environment	Three outdoor spaces in each facility
Behavior Mapping	1. Behavior mapping in target outdoor spaces	Users of three outdoor spaces in each facility
Survey	1. Survey of residents 2. Survey of staffs	All residents who are both cognitively intact and physically mobile residents identified by staffs in both facilities All staffs in both facilities
Focus Group Interview	1. Focus group interview with residents 2. Focus group interview with staffs	8-15 volunteered residents who are both cognitively intact and physically mobile residents identified by staffs from each facility 8-15 volunteered staffs
Data Analysis	1. Documentary analysis 2. Descriptive statistics 3. Qualitative data tabulation	Two facilities

### 3.6.2 Quantitative Methods

A quantitative method is a systematic empirical investigation of phenomena expressing data in a numerical form (Given, 2008). It is intended to provide unbiased, objective, and independent results which could be generalized to a larger population. In the field of relationships between environments and human behavior, quantitative data

are usually collected by an environmental assessment, behavioral mapping, and questionnaire.

Quantitative data obtained from SOS audit tool, behavior mapping and questionnaires will be collected. They will be tabulated and applied to explain the relationship between scores of five domains (evaluated by SOS tool) and outdoor usage (including the population of outdoor space usage recorded by behavior mapping, and weekly time spent in outdoor space based on the frequency of visits and duration of visits in outdoor spaces collected by questionnaires).

### **3.6.3 Qualitative Methods**

Qualitative methods seek to get in-depth understandings of *why* and *how* people perform a certain behavior, beyond the *where, what, when, and who* of quantitative methods. It helps to interpret the complicated human beings' behaviors and interactions from the perspectives of social context, personal meaning, culture, time, and space (Sankar & Gubrium, 1994).

In this study, the qualitative methods came from focus group interviews and open-ended questions of both versions of questionnaires. In this study, Qualitative data were collected from transcripts of interviews and answers to open-end questions of questionnaires. A content analysis strategy was used to generate research findings. Both deductive and inductive coding were applied to identify environmental features and categorized them into the five domains respectively, and therefore to identify the relationship between domains and users' satisfaction.

### **3.7 Research with Human Subjects**

This study has been approved by Institutional Review Board (IRB) approved for research on human subjects through questionnaires, focus group interviews, and individual interviews.

The initial IRB application for the research was approved by the Texas A&M University Office of Research Compliance on May 24, 2016. IRB2016-0364D (See Appendix H).

## **4. ENVIRONMENTAL AUDIT (SOS TOOL) RESULTS AND DISCUSSION**

### **4.1 Introduction**

Spending time outdoors can improve older adults' physical health and have psychological health. However, while people are getting older, they have increased risks of age-related disabilities. These disabilities may prevent older adults' ability and willingness to go outdoors. Many studies report the supportive potential of the outdoor physical environment to influential older adults' spending more time outdoors (Culter, 2000, Sugiyama & Ward Thompson, 2007; Rodiek, Nejati, Bardenhagen, Lee, & Senes, 2014). That means, older adults are willing to spend more time in outdoor spaces with more supportive potential.

Therefore, an effective evaluation of the outdoor spaces' supportive potential is important to explore the relationship between design features and older adults' outdoor space usage and satisfaction. Site visits using an environmental audit are crucial to observe the design and layout of outdoor spaces and to experience the space the way a user might. After visiting the site, the author documented the spatial layout, environmental setting characteristics, maintenance situation, as well as the basic feeling of each space in the target areas.

### **4.2 Literature Review on Environmental Assessment**

Environmental assessment is a widely adopted method in research on the built environment, especially in research using with Post-occupancy evaluation methods. It is believed that the design of spaces has an impact on people's behavior and environmental

assessment effectively helps researchers and designers to conduct research-informed design. Culter (2000) is one of the supporters of environmental assessment, and he believes that “people’s behavior in their environment is directly related to the design of the space and that an optimal environment is designed to meet the specific needs of an individual” (p.361). Therefore, an environmental assessment is an important component to conduct environmental related research and research-informed design.

Although many environmental assessment instruments have been published, there are limited numbers of instruments focused on older adults’ physical environments. Agency for Healthcare Research and Quality (AHRQ) (2007) listed around 70 measurement instruments. However, most of these instruments that target indoor environments are not for older adult related topics. Although several instruments, including the Therapeutic Environments Screening Scale (Sloane et al., 2002), and Residential Care Environmental Assessment (Topo, Kotilainen, & Eloniemi-Sulkava, 2012), contain a part of outdoor environment assessment for therapeutic environments, they only include a small proportion with just a few outdoor environment features.

The Seniors’ Outdoor Survey (SOS) developed by Susan Rodiek and her colleagues (see Appendix B) in 2014 is an instrument which focuses on 1) outdoor environment features and 2) long-term care settings. Although the SOS tool is developed based on Western culture, the nature of the SOS tool from the two aspects discussed above matches the nature of this research, which makes the SOS the best tool among the existing environmental assessment tools to conduct an outdoor environmental assessment in long-term care facilities in China.

### **4.3 Method (SOS Tool)**

The SOS tool was recently developed as a validated instrument which aims to assist a range of stakeholders, including researchers, designers, planners, and care providers to effectively evaluate outdoor features in long-term care facilities (Rodiek, Nejati, Bardenhagen, Lee, & Senes, 2014). Rodiek, Nejati, Bardenhagen, Lee, & Senes (2014) report that the SOS tool is a reliable instrument whose “Intraclass correlation coefficient (ICC) estimates of interrater reliability were .91 for the overall instrument, ranging from .83 to .98 for the 5 domains. Interrater reliability (ICC) was above .70 for more than 79% of individual items. Test-retest reliability (ICC) was .92, ranging from .81 to .98 for domains” (p. 222). According to the nature of this study which focuses on outdoor environment features in long-term care facilities, SOS is a suitable instrument to assess how well space meets the design requirements from functional and aesthetical perspectives. The SOS Tool has been applied to evaluate outdoor spaces senior homes in many countries including the U.S., Italy, and Japan (Bardenhagen & Rodiek, 2015; Fumagalli, Senes, Ferrara, Giornelli, Rodiek, Bardenhagen, 2016).

#### **4.3.1 Data-Collection Protocol**

A site evaluation was performed using the environmental audit tool — SOS. The researcher and one pre-trained research assistant conducted an environmental evaluation in each space by using the SOS tool one day before the first designated observational day at each facility. The research assistant was trained in the use of the SOS tool and did some practice observations in the outdoor spaces beyond the six target spaces. The SOS scores rated by the researcher and by the assistant were compared and the inter-rater

reliability was calculated using Intraclass Correlation (ICC) statistics. The training process continued until the inter-rater ICC was higher than 0.80. After the pre-training, the researcher and the research assistant followed the instructions of the SOS tool to evaluate the six target spaces from the five domains. The rating scores from the two raters were averaged.

#### **4.3.2 Content of Environmental Audit (SOS Tool)**

The SOS Tool is a scaled checklist that enables researchers to evaluate the presence and quality of common design elements by giving a score for each design category. It contains 60 items in 5 domains, including 1) access to nature with 14 items, 2) outdoor comfort and safety with 15 items, 3) walking and outdoor activities with 14 items, 4) indoor-outdoor connection with 11 items, and 5) connection to the world with 6 items.

The instruction of the SOS tool states a few steps to using the tool. First SOS requests the raters select boundaries of outdoor spaces. Second, raters should take a walk and sit in the space and experience the space by imagining themselves as older adults. They are encouraged to walk around slowly by using a walker or wheelchair and test the furniture. Third, raters rate each item from 1 to 7 (1 = worst, 7 = best) based on their reasonable expectation for the setting according to the climate, context and functional variables. The raters calculated the subtotal number in each domain and divide it by the number of items of each domain to get an average number, which is the Score for this domain. In addition, before scoring each item, the tool requests the evaluator select an option from “very well”, “fairly well”, “not well” to evaluate how

well a space provides a sense of escape from being indoors (including a feeling of fresh air views and all other natural elements). Forth, a recent standardized scoring system allows the users to weight the SOS scores and convert the 1-to-7 scores to a 100-base final score (Bardenhagen, Rodiek, Nejati, & Lee, 2018). This instrument helps researchers to “evaluate and compare the supportive potential of outdoor spaces” (Rodiek, 2014, p. 222).

#### 4.4 Results of Environmental Audit

After conducting the site evaluation at six spaces from two facilities by using the SOS tool, each space obtains a score in each domain. In addition, the sum of the scores of 60 items from all five domains were averaged to get an average score of each site. The scores helped the researcher to compare the supportive potential of outdoor spaces from each domain and the overall perspective.

##### 4.4.1 Results in Huishan Elderly Home

Table 4.1 Environmental Audit (SOS) Results in Huishan Elderly Home

Outdoor Space	Access to Nature	Outdoor Comfort and Safety	Walking and Outdoor Activities	Indoor Outdoor Connection	Connection to the World	Average Score	Inter-rater ICC (2 Raters)
Space A	89	79	92	100	92	90	0.95
Space B	81	77	90	100	95	89	0.95
Space C	86	76	82	90	80	83	0.96

Table 4.1 shows the SOS results of three spaces at Huishan Elderly Home. Space A get highest scores in domains of access to nature, outdoor comfort and safety, walking and outdoor activities, and indoor-outdoor connection, which ranges from 79 to 100. Space C get lowest scores in domains of outdoor comfort and safety, walking and outdoor activities, indoor-outdoor connection, and connection to the world. Space B have high scores in domains of indoor-outdoor connection and connection to the world, but low scores in access to nature and outdoor comfort and safety. Overall speaking, Space A has the highest average score while Space C has the lowest. In addition, all three spaces get a “very well” in an overall feeling of a sense of escape and relief from being indoors.

#### 4.4.2 Results in Nanshan Charity Home

Table 4.2 Environmental Audit (SOS) Results in Nanshan Charity Home

Outdoor Space	Access to Nature	Outdoor Comfort and Safety	Walking and Outdoor Activities	Indoor Outdoor Connection	Connection to the World	Average Score	Inter-rater ICC (2 Raters)
Space D	84	71	88	97	95	87	0.80
Space E	82	73	80	94	87	83	0.95
Space F	88	77	86	80	89	84	0.88

Table 4.2 shows the SOS results of three spaces at Nanshan Charity Home. Space D gets the highest scores in domains of walking and outdoor activities, indoor-outdoor connection, and connection to the world, which range from 71 to 97. Space E has relatively high scores in domains of indoor-outdoor connection. Space F got the highest

score in the domain of access to nature. Overall speaking, Space D has the highest average score while Space F has the lowest. In addition, in the section of the overall rating for the sense of escape and relief, both raters gave very well to Space D and Space E. One rater gave very well, and one gave fairly well to Space F.

#### **4.5 Discussion and Conclusion from Environmental Audit**

The results of the SOS tool allow the researcher to rate and compare the features of outdoor spaces. From the results, we can tell Space A and Space B from Huishan Elderly Home have good ratings in all the five domains and all three spaces from Nanshan Charity Home have moderate scores in most of the domains. The average score of each space matches the overall rating on a sense of escape and relief from being indoors.

In conclusion, Space A and Space B can provide a high level of supportive potential for older adults and are more appealing to users for relief, Space C, Space D and Space E and Space F can provide a moderate level of supportive potential and are fairly appealing.

## **5. BEHAVIOR MAPPING RESULTS AND DISCUSSION**

### **5.1 Introduction**

Behavior mapping as a direct observation method is a promising way to objectively measure physical activity and environmental data at a sufficiently detailed level. (Cosco, Moore, & Islam, 2010). Behavior mapping is developed based on the concepts of behavior setting and affordance, (Cosco, Moore, & Islam, 2010) and is adequate to apply in this particular research. In this study, behavior mapping was used to systematically recording outdoor space users' location and actions. It is an empirical way to accurately record people's variety of actions at different locations (Sommer & Sommer, 2002). It helps to find a connection between people's behaviors and design layouts.

### **5.2 Method (Behavior Mapping)**

#### **5.2.1 Data-Collection Strategy**

This study mainly recorded the outdoor space users' activities in predetermined times in six outdoor spaces from Huishan Elderly Home and Nanshan Charity Home. The main purpose of a behavior mapping is to find out the relationship between outdoor space users, design features, and design layouts. Other purposes include systemically recoding residents' actions in outdoor spaces, exploring behavior patterns in outdoor spaces, and triangulating two other methods including environmental assessment and surveys to obtain comprehensive findings.

In this study, an instrument developed based on a direct observation system – System for Observing Play and Recreation in Communities (SOPARC) will be applied in the field to “systematic and periodic scan individuals and contextual factors within pre-determined target areas” in outdoor spaces (McKenzie & Cohen, 2006). Gender, mobility level, physical activity level, identity, and participant location were recorded.

### **5.2.2 Behavior Mapping Schedule**

Behavior Mapping was conducted in three periods of each day, including morning, afternoon, and evening (See Table 5.1). Designated daily observations were conducted at each facility in an accumulative week, from Sunday to Saturday. Facilities were alternated for observation days to minimize the effects from inclement weather. For those scheduled observational days which were unsuitable due to inclement weather, observation for these days was postponed to the same day in the following week. The observation days are shown in Table 5.2.

Table 5.1 Example of Observational Period in a Single day

Morning Period Outdoor Spaces	8:30- 8:40	8:50- 9:00	9:10 - 9:20	9:30 - 9:40	9:50- 10:00	10:10 - 10:20
	C	B	A	C	B	A
Afternoon Period Outdoor Spaces	2:30- 2:40	2:50- 3:00	3:10 - 3:20	3:30- 3:40	3:50- 4:00	4:10 - 4:20
	A	C	B	A	C	B
Evening Period Outdoor Spaces	4:30- 4:40	4:50 - 5:00	5:10- 5:20	5:30- 5:40	5:50 - 6:00	6:10- 6:20
	A	B	C	A	B	C

Table 5.2 Observation Days

<i>Date</i>	5/29 (SU)	5/30 (MO)	5/31(TU)	6/1(WE)	6/2(TH)	6/3(FR)	6/4(SA)
Facilities	HEH	NCH	HEH	NCH	HEH	NCH	HEH
<i>Date</i>	6/5(SU)	6/6(MO)	6/7(TU)	6/15(WE)	6/16(TH)	6/10 (FR)	6/11 (SA)
Facilities	NCH	HEH	NCH	HEH	NCH	HEH	NCH

\* HEH represents Huishan Elderly Home  
 \* NCH represents Nanshan Charity Home

### 5.2.3 Behavior Mapping Protocol

Zone number, activity, gender, and role were recorded. Based on the preliminary data analysis, activities in the six spaces can be categorized into 11 categories, including the following:

1. Walking with no aid
2. Walking with aid

3. Pushing wheelchairs for companions
4. Sitting in wheelchairs
5. Sitting on seats
6. Standing
7. Talking
8. Group Exercises
9. Individual Exercises
10. Watching or playing with wildlife
11. Others

Role has been categorized into three groups, including

1. Residents
2. Staff
3. Visitors

Gender has been categorized into two groups, including

1. Female
2. Male

Pictures were taken in each pre-defined zone in the outdoor spaces. Information from pictures was translated to behavior mapping data collection forms and coded based on the previous categories discussed above (see Appendix F).

### **5.3 Results of Behavior Mapping**

#### **5.3.1 Results in Huishan Elderly Home**

Three outdoor spaces are observed in Huishan Elderly Home, designated as Space A, Space B, and Space C. Space A is the largest open space at this facility. Two circular plazas are in Space A. One is Waterfront Plaza with a tree in the center and a platform above the water. The other is Sunset Plaza which also has a big tree in the center and a shaded structure at the corner. Trails in the garden connect Sunset Plaza and buildings. A third area, Space A has a fish pond, which is surrounded by a meandering trail. In addition, a traditional Chinese gazebo is on its south corner. Figure 5.1 shows the layout of Space A, and Figure 5.2 shows pictures of different zones at Space A.

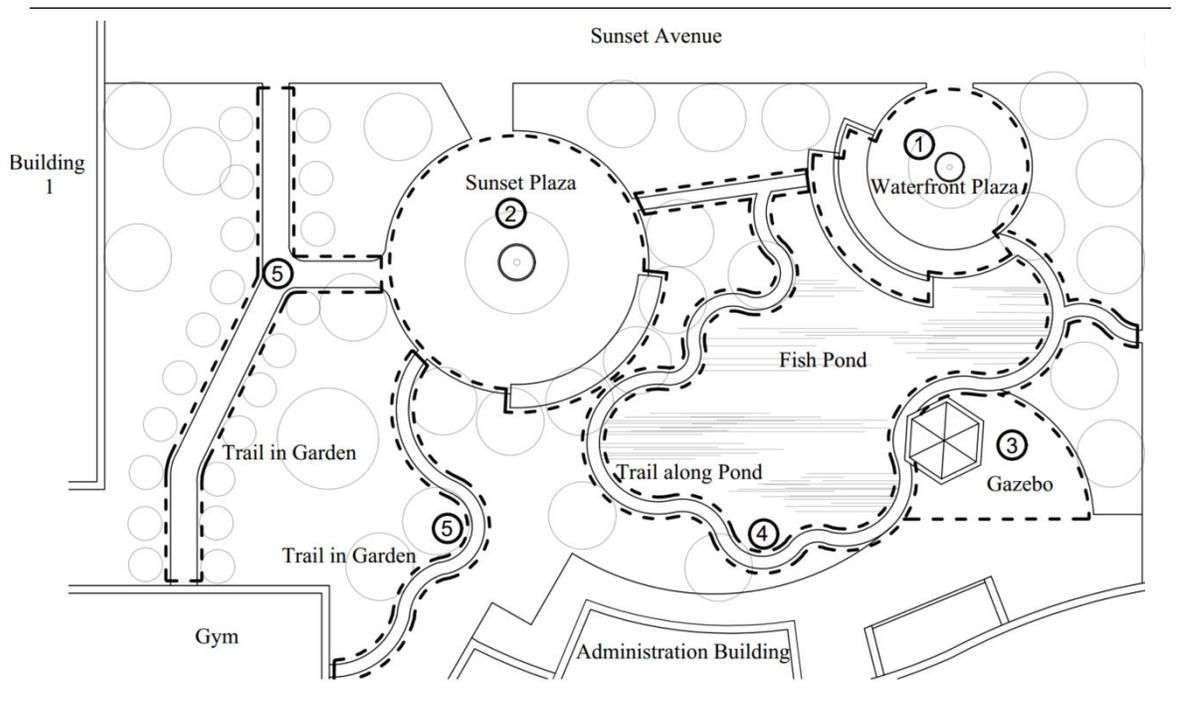


Figure 5.1 Space A (Major Garden) Layout



Waterfront Plaza



Gazabo



Sunset Plaza



Riverfront Plaza

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Figure 5.2 Pictures of Space A (Major Garden)

According to the behavior mapping data collected from Space A, there was a total of 1780 people have been observed (See Table 5.3). The most frequent activity in Space A is walking with no aid, second is sitting on seats, and third is walking with aid (See Figure 5.3).

Table 5.3 Behavior Mapping Data of Space A

	Zone 1 Waterfront Plaza	Zone 2 Sunset Plaza	Zone 3 Gazebo	Zone 4 Trail along Pond	Zone 5 Trails in Garden	Total
Walking with no aid	56	89	11	58	81	295
Walking with aid	51	77	69	21	12	230
Pushing wheelchairs for companions	3	9	0	0	6	18
Sitting in wheel chairs	15	18	0	0	6	39
Sitting on seats	0	121	118	0	0	239
Standing	56	88	61	5	0	210
Talking	16	91	145	0	0	252
Group Exercises	53	135	0	0	0	188
Individual Exercises	39	76	0	11	0	126
Watching or play with wildlife	76	6	45	31	0	158
Others	6	16	0	3	0	25
<b>Total</b>	<b>371</b>	<b>726</b>	<b>449</b>	<b>129</b>	<b>105</b>	<b>1780</b>

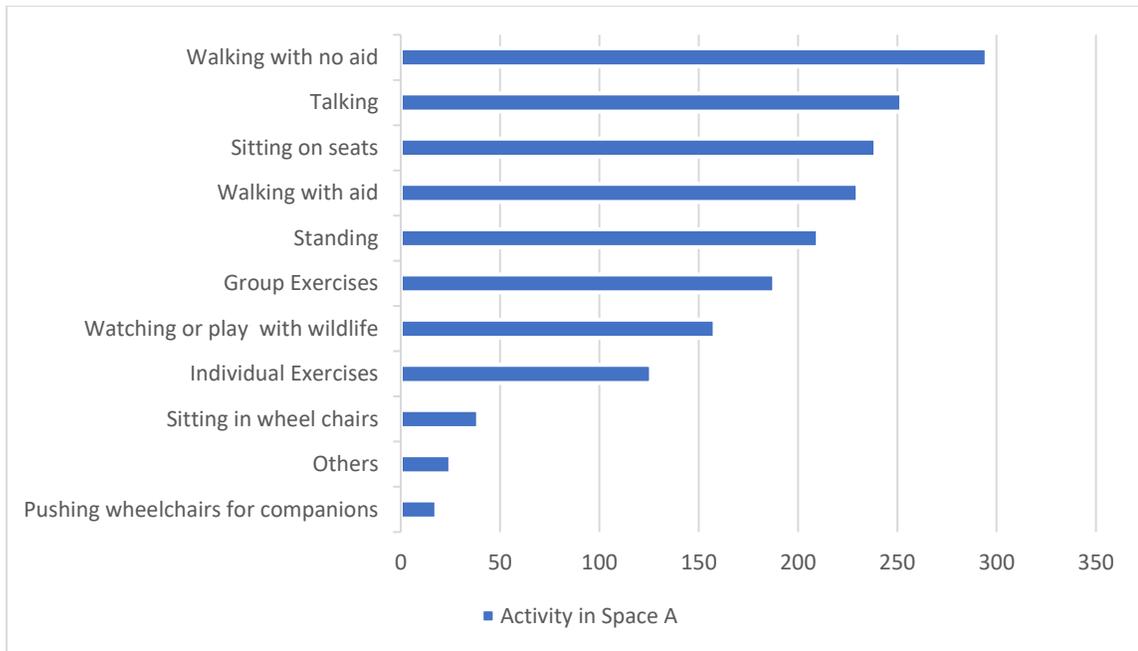


Figure 5.3 Activities in Space A

Most people in Space A walked in plazas and along trails. People who walked in plazas are more likely to walk for leisure while those walking on trails in the gardens are more likely to be going to buildings. Almost half people in Space A walk with no aid and half with aid. Only a limited number of people in Space A use wheelchairs.

In addition, many people were sitting in Space A and talking with others. Because space A has a covered space with seats in Sunset Plaza and a Gazebo with seats, many people sat in these places to chat with others.

Space A provides several open spaces for group exercises and individual exercise. People gathered in Waterfront Plaza and Sunset Plaza to have groups exercises. Some did not join in groups but conducted individual exercises in both plazas.

Because Space A has a big fish pond, many people stand along the pond to watch and feed the fish. Many places give them an opportunity to enjoy the water views, including the Waterfront Plaza, the Gazebo, and the trail along the pond.

Space B is nearby the main entrance. It has a spacious walk-way, which is named Sunset Avenue and two lines of trees with planter/benches on both sides which allow people to sit in groups. Beyond the tree seat planters, there is one open space in front of the dining hall. Figure 5.4 shows the layout of Space B, and Figure 5.5 shows the views.

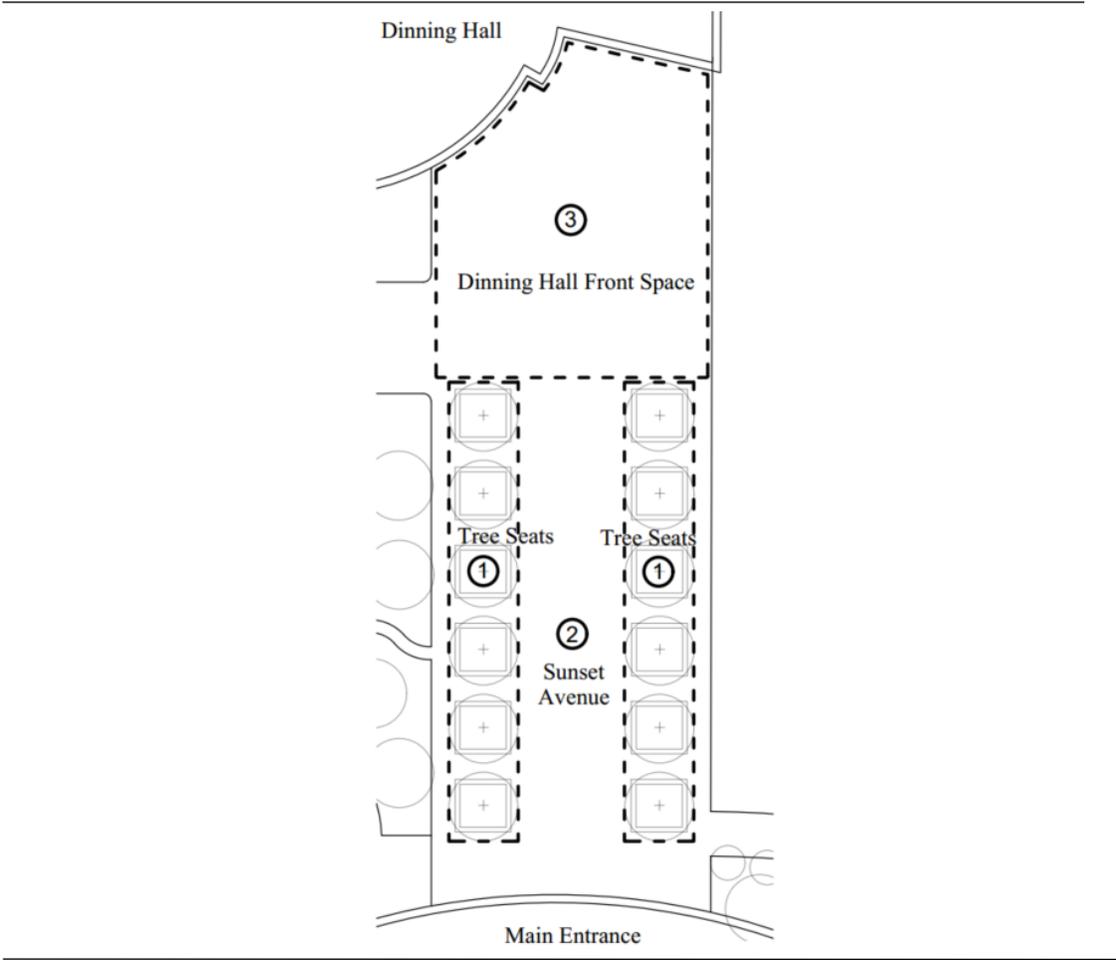


Figure 5.4 Space B (Tree Seats Plaza) Layout



Figure 5.5 Pictures of Space B (Tree Seats Plaza)

A total of 2174 people have been recorded in three zones, the most active being Zone 1 (See Table 5.4).

Table 5.4 Behavior Mapping Data in Space B

	Zone 1 Tree Seats	Zone 2 Sunset Avenue	Zone 3 Dining Hall Front Space	Total
Walking with no aid	0	131	115	246
Walking with aid	0	18	31	49
Pushing wheelchairs for companions	0	12	3	15
Sitting in wheelchairs	0	19	7	26
Sitting on seats	512	0	0	512
Standing	0	81	228	309
Talking	231	21	43	295
Group Exercises	0	11	0	11
Individual Exercises	0	8	0	8
Watching or play with wildlife	0	0	0	0
Others	0	2	0	2
<b>Total</b>	<b>743</b>	<b>303</b>	<b>427</b>	<b>1473</b>

Figure 5.6 shows the activities in Space B. The most frequent activity is sitting on the tree seats. More than one-half of the people were talking. The second most frequent activity was standing. Many people were standing in front of the dining hall.

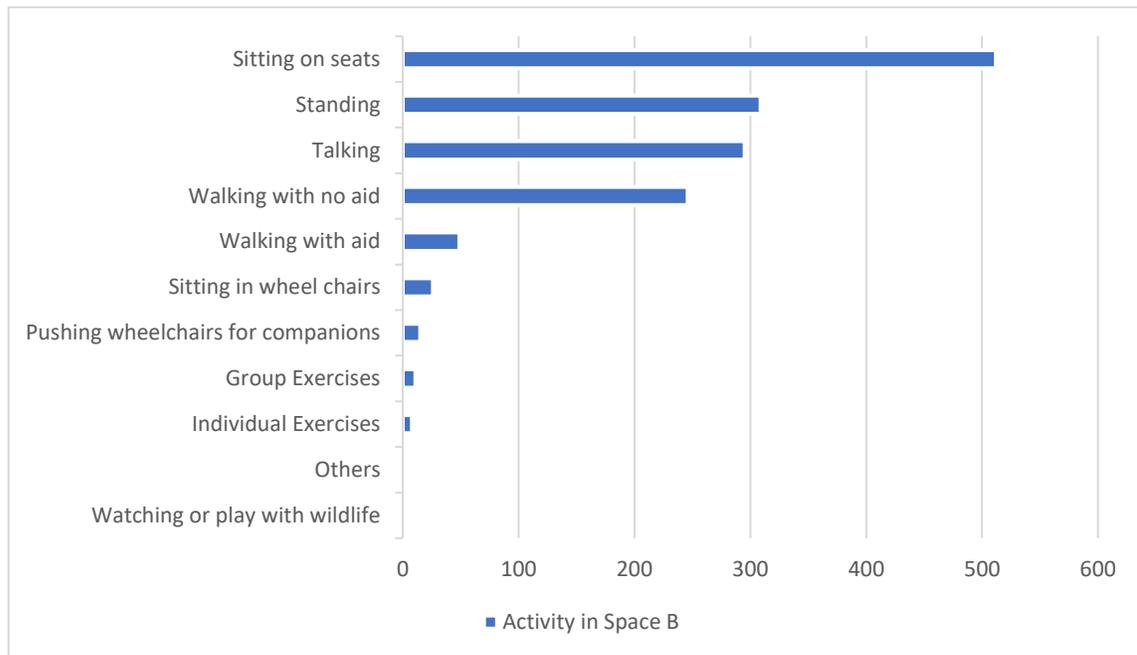


Figure 5.6 Activities in Space B

Space C is at the south corner of the facility. It is surrounded by lush plants and appears quiet. Two loops of meandering trails are designed for walking. At the end of the loop, there is a space covered by an umbrella-shaped tensioned membrane for shading. The big umbrella structure provides a space for gathering and a few benches for resting. Figure 5.7 shows the layout of Space C and Figure 5.8 shows the views.

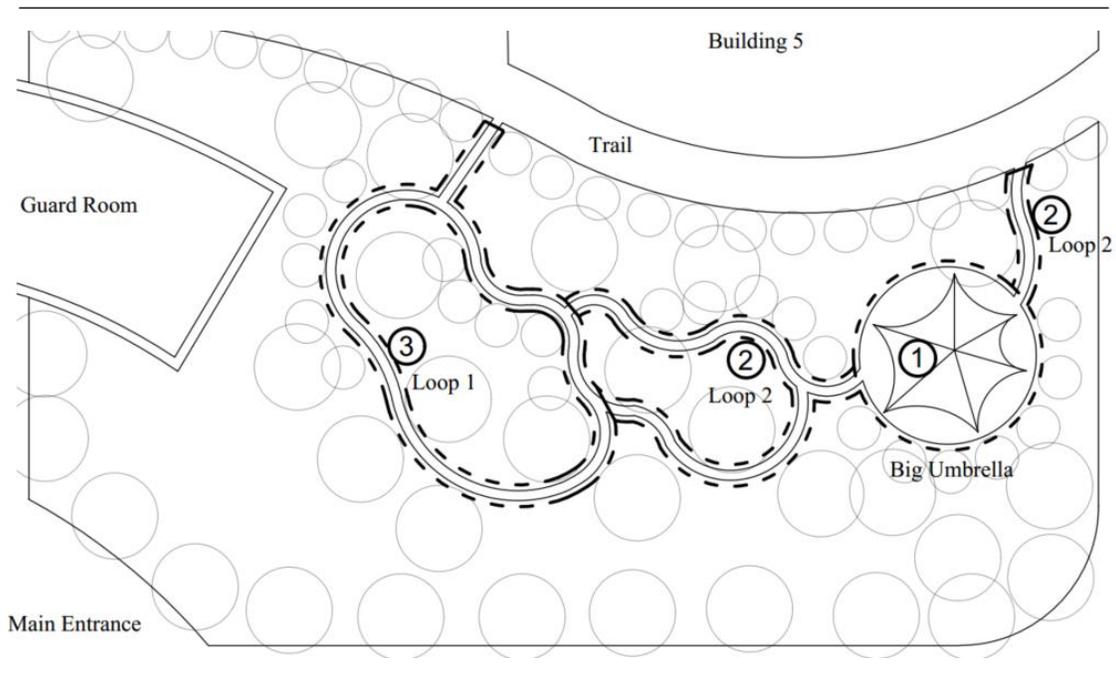


Figure 5.7 Space C (Big Umbrella) Layout

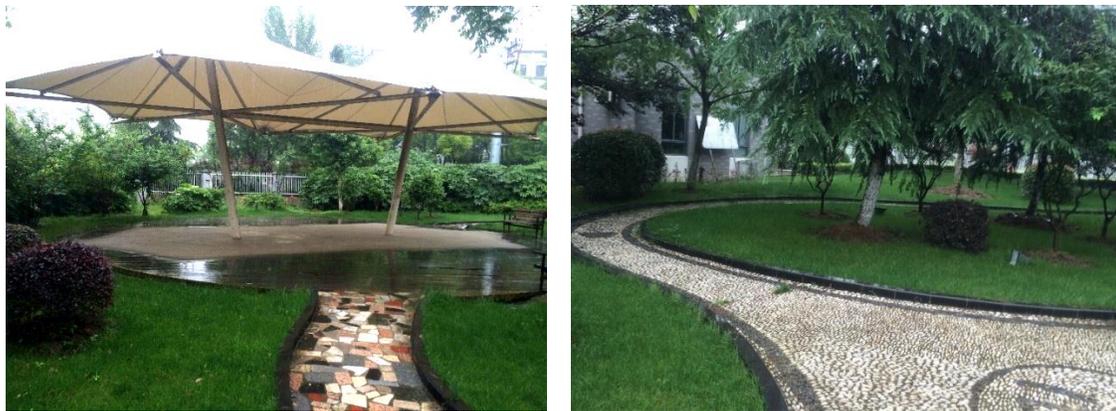


Figure 5.8 Pictures of Space C (Big Umbrella)

A total of 460 people was recorded. Most of them were in the big umbrella area (See Table 5.5). There were only a limited number of activities in Loop 1 and Loop 2.

Table 5.5 Behavior Mapping Data of Space C

	Zone 1 Big Umbrella	Zone 2 Loop 2	Zone 3 Loop 1	Total
Walking with no aid	3	41	23	67
Walking with aid	0	12	5	17
Pushing wheelchairs for companions	0	0	0	0
Sitting in wheel chairs	0	0	0	0
Sitting on seats	121	0	0	121
Standing	39	2	0	41
Talking	11	6	0	17
Group Exercises	96	0	0	96
Individual Exercises	41	13	21	75
Watching or play with wildlife	21	0	2	23
Others	3	0	0	3
<b>Total</b>	<b>335</b>	<b>74</b>	<b>51</b>	<b>460</b>

According to the analysis, most of the people visited Space C were taking a seat or standing or exercising in the big umbrella area (See Figure 5.9). There were no wheelchairs users seen in Space C. One of the possible reason is that neither loop 1 or loop 2 is wheelchair friendly. The pebble paving prevents the wheelchair get access. A second reason is that Space C is at the corner of the facility, making it more distant from most buildings.

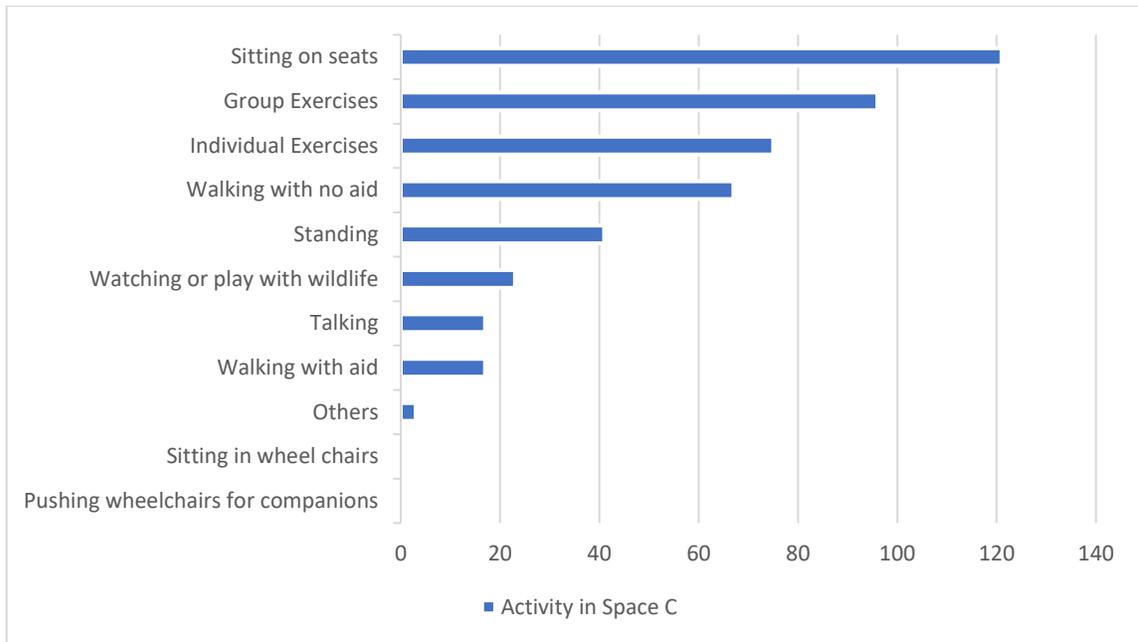


Figure 5.9 Activities in Space C

### 5.3.2 Results in Nanshan Charity Home

Space D is the entry garden to the facility. It contains a small fish pond surrounded by a few boulders, and a looped trail allowing people to walk around. Figure 5.10 shows the layout and Figure 5.11 shows the views of Space D.



Figure 5.10 Space D (Entry Garden) Layout



Figure 5.11 Pictures of Space D (Entry Garden)

A total of 912 people were recorded in Space D. Most of them happened in Zone 1 (See Table 5.6).

Table 5.6 Behavior Mapping Data of Space D

	Zone 1	Zone 2	Total
	Fish Pond Platform	Trail	
Walking with no aid	34	159	193
Walking with aid	21	89	110
Pushing wheelchairs with companions	0	0	0
Sitting in wheelchairs	0	0	0
Sitting on seats	35	41	76
Standing	135	11	146
Talking	51	21	72
Group Exercises	0	0	0
Individual Exercises	0	0	0
Watching or play with wildlife	315	0	315
Others	0	0	0
<b>Total</b>	<b>591</b>	<b>321</b>	<b>912</b>

According to the data analysis, most people watch play with wildlife in Space D (See Figure 5.12). Because the major body of Space D consists of a fish pond, many residents came to the space to stand on the platform or sit on boulders or on chairs they brought by themselves to watch the golden fish in the pond. There were no wheelchair users seen in Space D. The possible reason is that there is a curb surrounding Space D, which prevents wheelchair access.

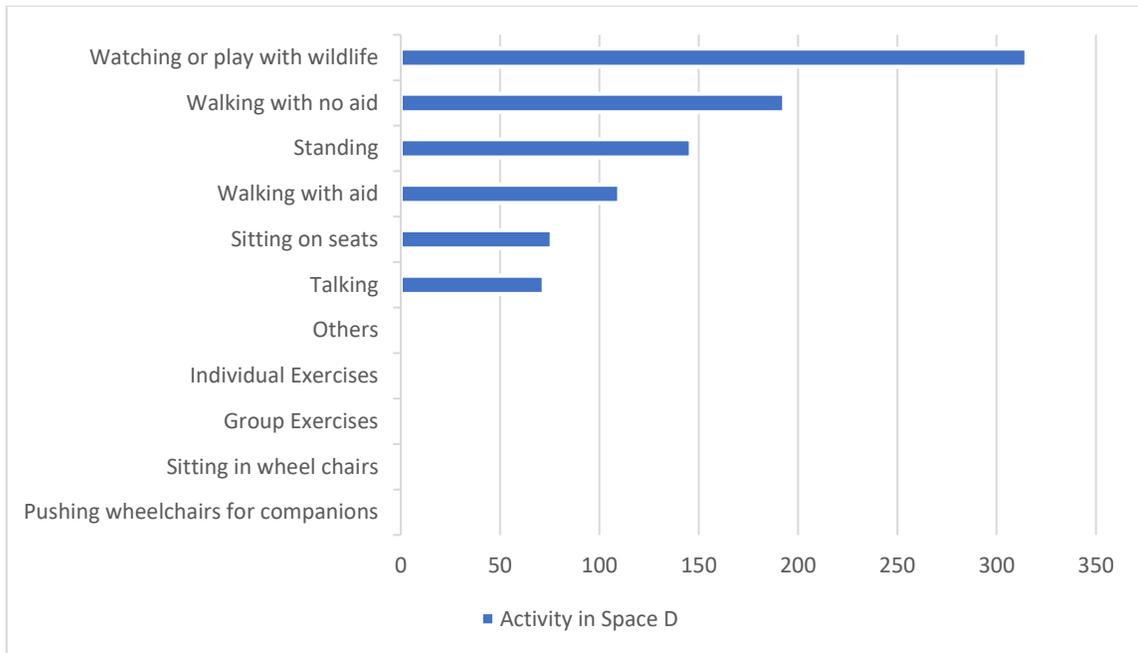


Figure 5.12 Activities in Space D

Space E is an outdoor gym close to the administration building and Building II. It provides outdoor fitness facilities, outdoor spaces between the buildings, and four marble benches. Figure 5.13 shows the layout and Figure 5.14 shows the views of Space E.

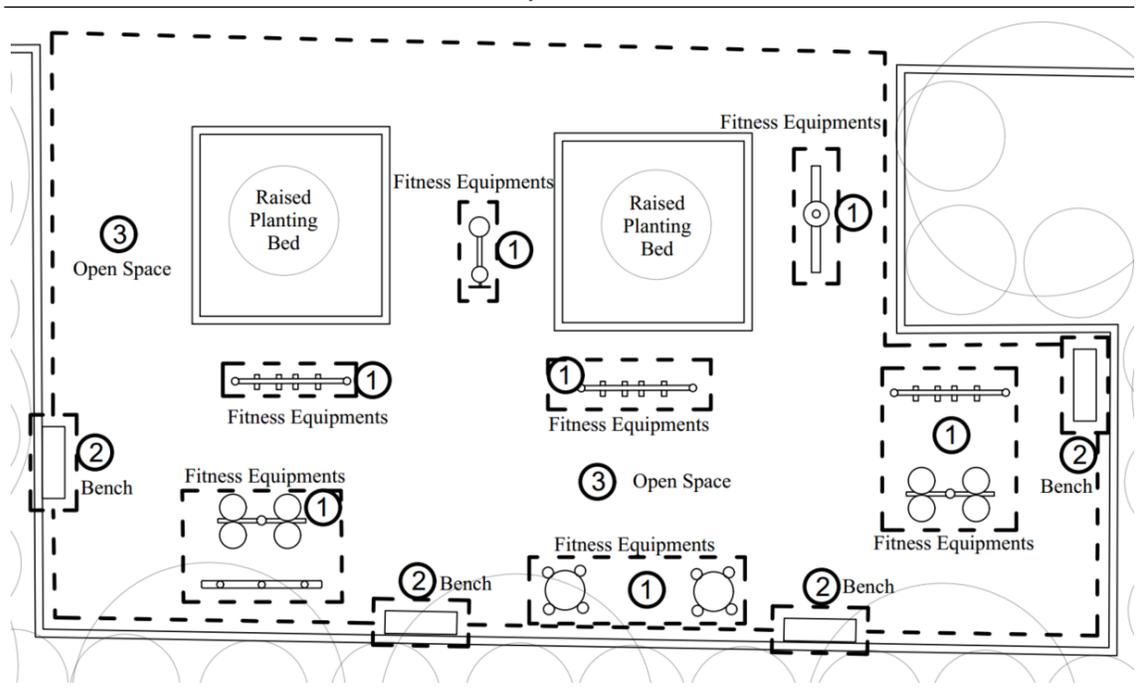


Figure 5.13 Space E (Outdoor Gym) Layout



Figure 5.14 Pictures of Space E (Outdoor Gym)

A total of 1072 people were recorded in Space E (See Table 5.7). Most of them were seen in the open space between the equipment or on equipment.

Table 5.7 Behavior Mapping Data of Space E

	Zone 1 Fitness Equipment	Zone 2 Bench	Zone 3 Open Space	Total
Walking with no aid	0	0	93	93
Walking with aid	0	0	61	61
Pushing wheelchairs for companions	0	0	55	55
Sitting in wheel chairs	0	0	61	61
Sitting on seats	0	94	0	94
Standing	0	0	97	97
Talking	21	36	21	78
Group Exercises	0	0	18	18
Individual Exercises	421	0	91	512
Watching or play with wildlife	0	0	0	0
Others	0	3	0	3
<b>Total</b>	<b>442</b>	<b>133</b>	<b>497</b>	<b>1072</b>

According to the observations, most people visited Space E for individual exercise, which is very reasonable in an outdoor gym (See Figure 5.15). Several people sat on benches or in wheelchairs to take a rest or watch others work out. Some individual exercises and group exercises happened in the open space between the equipment.

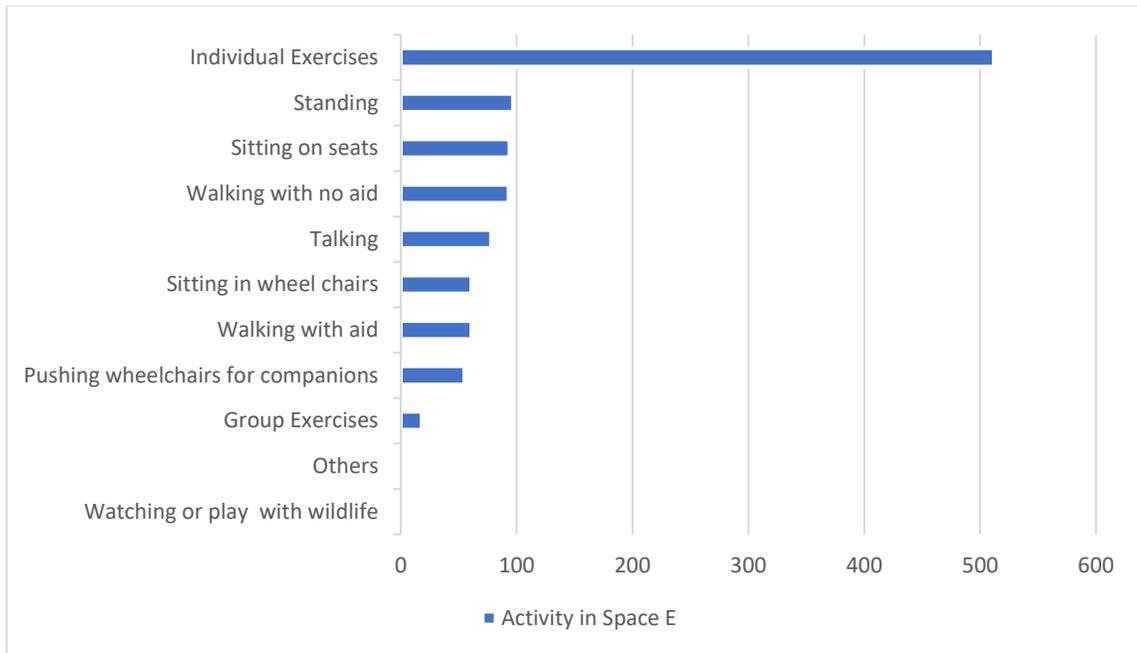


Figure 5.15 Activities in Space E

Space F is the central garden of this facility. It contains a man-made water channel, a waterfront platform, a bridge, a Chinese style gazebo, an open space in front of a residential building, a few benches, and a variety of plants. Figure 5.16 shows the layout of Space F and Figure 5.17 shows the views of Space F.

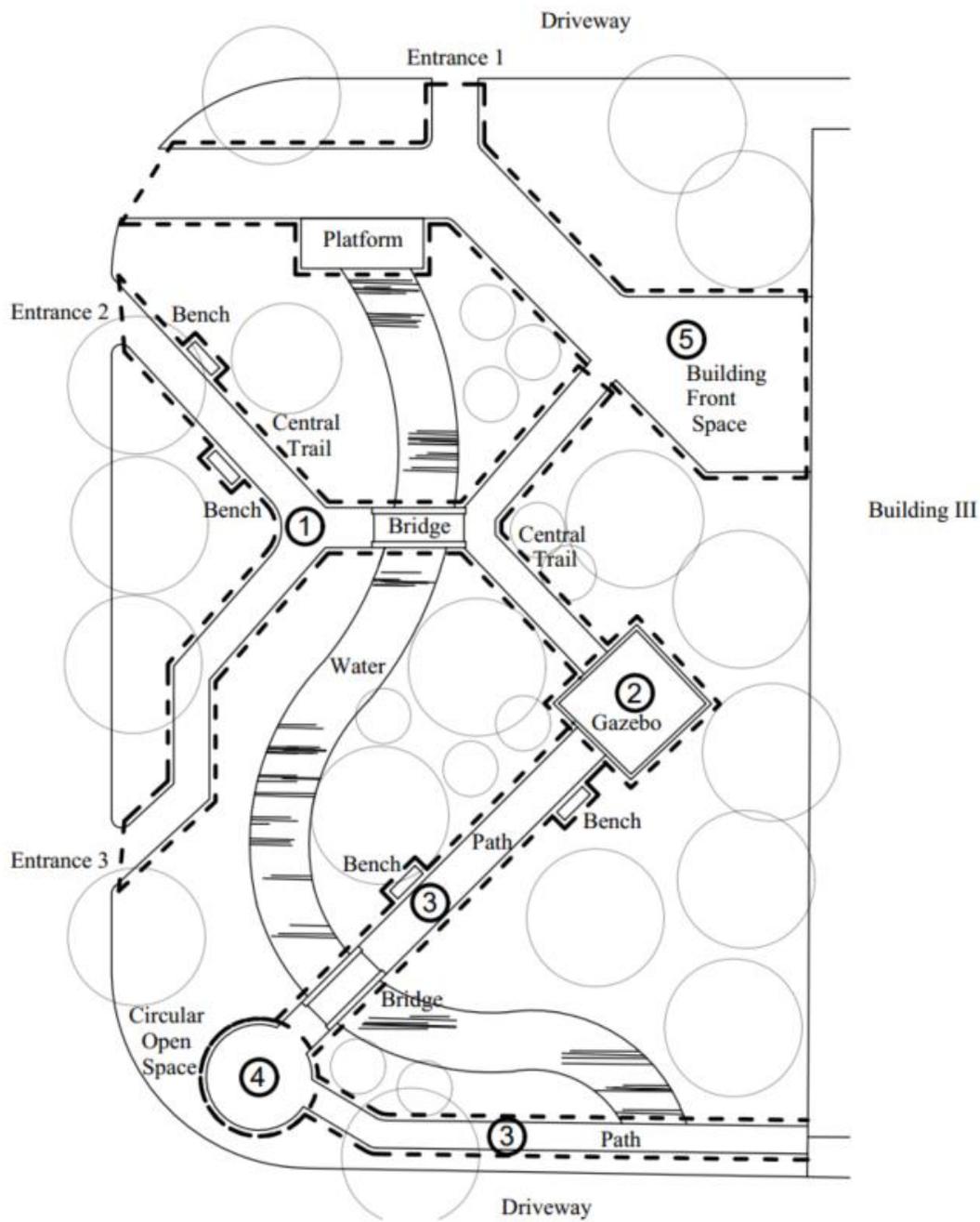


Figure 5.16 Space F (Central Garden) Layout



Figure 5.17 Pictures of Space F (Central Garden)

A total of 1229 activity have been observed in Space F (See Table 5.8). Most of the activities happened along the central trail and in the gazebo.

Table 5.8 Behavior Mapping Data of Space F

	Zone 1 Central Trail	Zone 2 Gazebo	Zone 3 Path	Zone 4 Circular Open Space	Zone 5 Building Front Space	Total
Walking with no aid	101	2	97	6	56	262
Walking with aid	59	0	11	2	45	117
Pushing wheelchairs for companions	21	50	36	0	2	109
Sitting in wheel chairs	33	55	30	0	2	120
Sitting on seats	131	215	21	0	0	367
Standing	31	13	0	0	0	44
Talking	25	101	6	0	0	132
Group Exercises	0	0	0	0	0	0
Individual Exercises	12	0	3	0	0	15
Watching or play with wildlife	36	0	14	0	6	56
Others	2	5	0	0	0	7
<b>Total</b>	<b>451</b>	<b>441</b>	<b>218</b>	<b>8</b>	<b>111</b>	<b>1229</b>

According to the data analysis, the most frequent activity in Space F is sitting on benches (See Figure 5.18). Space F is a beautiful garden with a lot of greenery and also provides several seating options, including benches along the trail and bench in the gazebo.

Walking is another frequent activity. Many people walk in Space F with or without aid. The number of people walking with an aid is about one half of those without an aid. In addition, many people are pushing wheelchairs for companions and go around in the central garden together.

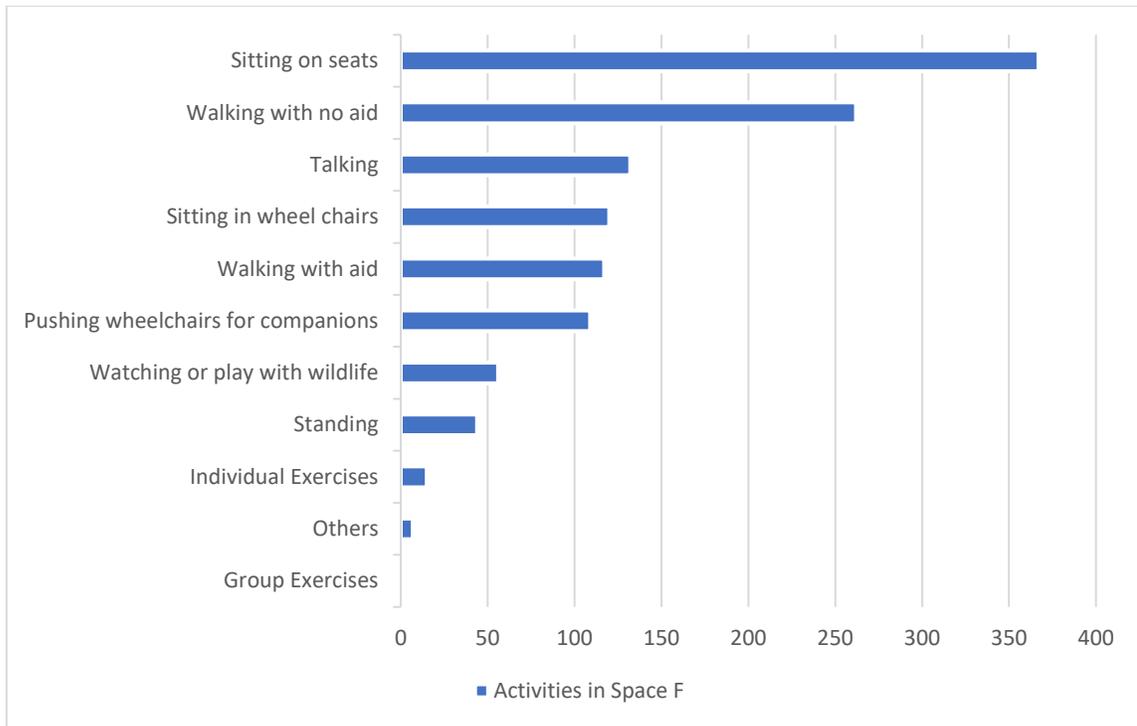


Figure 5.18 Activities in Space F

#### 5.4 Discussion and Conclusion from Behavior Mapping

Different outdoor spaces have different features. People performed different activities in the six outdoor spaces shown above based on the features of the spaces. In the other word, the supportive potential of the outdoor physical environment is partially determined by how the older adults' use space and how much time they spend there.

According to the behavior mapping and data analysis in the six spaces, there are some phenomena that have been noticed based on some of the different affordances.

### ***Walkway***

Most of the walking activity happens on walkways. Therefore, the design of the walkways is essential to the users. First, the walkway should be wide enough to accommodate at least one wheelchair and one accompanying person. Second, the walkway should be smooth, even, and having shallow slopes to enable wheelchair access. Third, walkways surrounded by trees, flowers, and other natural features are more likely to be used, because of interest and comfort.

### ***Seating Options***

In addition to walking, sitting is another frequent activity observed in the six outdoor spaces. Seats adjacent to natural features and seats along the walkway are more popular. Many people were observed to sit in a group, although some people were seen to sit away from the crowd. Therefore, seating options for both group and individuals are suggested to be provided by the facility.

### ***Open Spaces for Group Exercises***

Much of group exercise has been observed in both facilities. People played Tai Chi, Qigong, plaza dancing, and instruments in groups. It is recommended to provide spaces for group exercise in long-term care facilities to support the needs of group exercise activities.

### ***Distance from Buildings to Outdoor Spaces***

Residents, especially those who need walking aids are more likely to use outdoor spaces adjacent to the buildings. Although some residents were observed to separate

from the crowd and go to spaces far away from the buildings, most residents choose the spaces near their rooms. Base on the facts, it is suggested that most of the outdoor spaces should adjacent to the buildings.

### ***Outdoor Gym***

A high number of residents were observed using the outdoor gym. Most of them used the fitness equipment provided by the gym. Some used the open spaces between equipment to do exercise. And some group exercises were performed in the outdoor gym. In addition, some residents did not participate in exercise, but only chatting and observing others doing exercises. Staff sometimes were found to accompanying residents in the outdoor gym. They were also noticed to use the equipment a few times after work.

### ***Wildlife Observation Opportunity***

Many residents were observed watching fish in the pond in both facilities. Several residents were found to feed feral cats and watch butterflies. Therefore, providing opportunities to observe wildlife may improve the time senior adults' spend being outdoors in the fresh air and more active.

## **6. SURVEY RESULTS AND DISCUSSION**

### **6.1 Introduction**

The questionnaire survey is one of most commonly used and powerful tools used to collect information in social science. It is an effective and affordable method to collect massive data, including both qualitative and quantitative data in a short period. Although questionnaire surveys are most commonly used to gather quantitative data, the design of open-ended questions in questionnaire allows the researcher to ask why. In this way, the researcher can explore details and collect qualitative information. The previous research shows that questionnaire survey methods are widely applied and performs as an effective data collection tool in studies related with the aging environment (Heath, 2001; Kearney, 2006, Rodiek, 2006; Rodiek, 2009; Stigsdotter, 2010; and Crisp, 2013).

### **6.2 Method (Questionnaire)**

The questionnaire used in this research has two versions. One is a residential questionnaire (see Appendix C), and the other is a staff questionnaire (see Appendix D). Both of them are developed based on a pre-approved questionnaire provided by Dr. Susan Rodiek and her colleagues. In this study, a questionnaire will be used to systematically determine personal outdoor usage patterns and satisfaction with design features. Questions include staff and senior residents' demographic information (age & sex), residents' health conditions, seniors residents' and staff frequency and duration of using outdoor spaces, design features that they are satisfied and unsatisfied with, and

their purpose of going to the outdoor spaces, which capturing their past outdoor activities and importance of those activities.

## **6.2.1 General Structure of the Questionnaire**

### **6.2.1.1 Resident Questionnaire**

The resident survey included a total of 36 items, including 22 closed-end questions, 3 short open-ended questions, 4 narrative questions and 7 questions with both closed-end questions and open-ended questions. The survey instrument has three sections, including:

1. Resident Demographic and Health Profiles
2. Residents' Perception of Outdoor Space Usage
3. Residents' Outdoor Space Usage and Their Satisfaction of Outdoor Space Features

Section 1 includes questions such as gender, age, job position, health condition, time spent in the facility, and time spent outdoors when growing up.

Section 2 includes questions such as whether they spend much time outdoors when they grow up, whether residents care about spending time outdoors, and their feeling after spending time outdoors.

Section 3 focuses on residents' time spent outdoors from three perspectives. First, how much time residents spend outdoors. Second, how residents use outdoor spaces. Third, residents' perception of facility outdoor areas.

### **6.2.1.2 Staff Questionnaire**

The staff survey included a total of 35 items, including 15 closed-end questions, 2 short open-ended questions, 7 narrative questions and 11 questions with both closed-ended questions and open-ended questions. The survey instrument has three sections, including

1. Staff Demographic and Work Profiles
2. Staff Observation and Perception of Residents' Outdoor Space Usage
3. Staff Outdoor Space Usage and Their Satisfaction with Outdoor Space Features

Section 1 includes questions such as gender, age, job position, employment history, health condition, and time spent outdoors when they grew up.

Section 2 focuses on three topics based on staff observation and perception. First, how much time residents spend outdoors. Second, how residents use outdoor spaces. Third, staff perception of residents spending time outdoors.

Section 3 focuses on staff time spent outdoors from three perspectives. First, how much time staff spends outdoors. Second, how staff uses outdoor spaces. Third, staff perception of facility outdoor areas.

### **6.2.2 Questionnaires Collection Procedure and Response Rate**

A drop-off questionnaire method was applied to deliver questionnaire by hand to interviewers. The nature of facilities for the elderly usually being in a small and congregate neighborhood determines that the drop-off questionnaire method is an efficient method of delivery. The researcher delivered a resident version of the

questionnaire to each both cognitively intact and physically mobile residents identified by staffs. Residents were encouraged to finish questionnaires by themselves. The researcher delivered a staff version of the questionnaire to each staff person. During the process of conducting the questionnaire, the researcher was on site and provided the required assistance. The researcher collected all questionnaires after they were finished.

A total of 266 resident questionnaires and 109 staff questionnaires were handed out in Huishan Elderly Home, 77 resident questionnaires were returned and among them, 64 resident questionnaires were completed. The response rate of resident questionnaires was 28.9%. 31 staff questionnaires were returned and 27 of them were completed. The response rate of staff questionnaire was 28.4%.

In Nanshan Charity Home, a total of 124 resident questionnaires and 60 staff questionnaires were handed. Among them, 40 resident questionnaires were returned, and 35 resident questionnaires were completed. The response rate of resident questionnaires was 32.3% of staff questionnaires, 26 were returned and 25 of them were completed. The response rate of staff questionnaire was 43.3%.

In the analysis, the incomplete questionnaires were excluded from the dataset.

## **6.3 Questionnaire Results and Descriptive Analysis**

### **6.3.1 Resident Questionnaire Results and Descriptive Analysis**

#### **6.3.1.1 Demographic Information and Health Profile**

The 64 completed resident questionnaires from Huishan Elderly Home shows the mean age of responders is 75.1, the oldest is 95 and the youngest is 59. Among them 19

are females, accounting for 30% of the respondents, and 45 are males, which accounts for 70% of the responders (See Figure 6.1). They stayed at the facility about 4.6 years on average. The longest one is 7 years and the shortest one is 6 months.

The 35 completed resident questionnaires from Nanshan Charity Home shows the mean age of responders is 82.5, the oldest is 94 and the youngest is 65. Among them, 23 are females, which accounts 66% of the responders, and 12 are males, which accounts 34% of the responders (See Figure 6.1). They stayed at the facility about 2.7 years on average. The longest one is 5 years and the shortest one is 6 months.

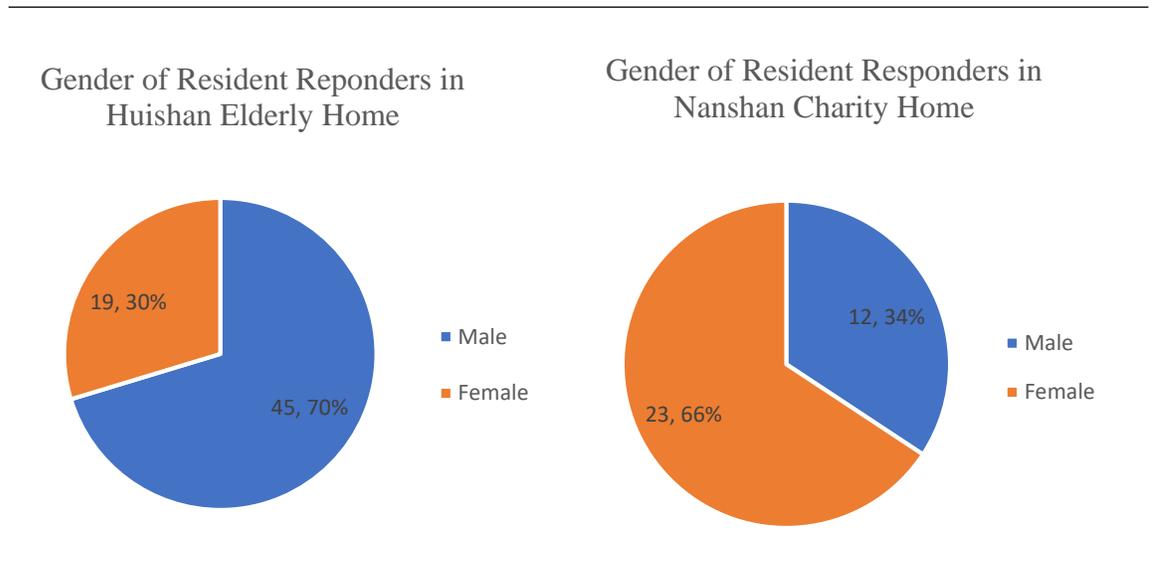


Figure 6.1 Age of Resident Responders

In Huishan Elderly Home, respondents' former occupation includes worker, farmer, housewife, and others. They were 7 workers (11%), 46 farmers (72%), 10 housewives (16%), and one other (1%) (See Figure 6.2).

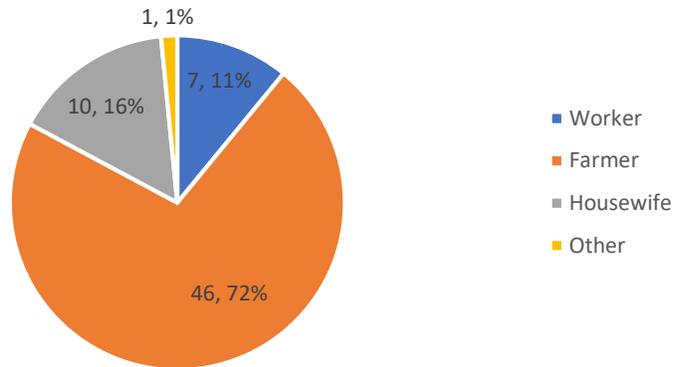


Figure 6.2 Residents' Former Occupation in Huishan Elderly Home

In Nanshan Charity Home, the respondent's former occupation includes a variety of careers. The biggest three groups are workers, engineers, and teachers. They are 11 workers (27%), 6 engineers (15%), and 5 teachers (12.5%). The other types of occupations include farmer, civil servant, bank employee, supervisor, accountant, nurse, and doctor (see Figure 6.3).

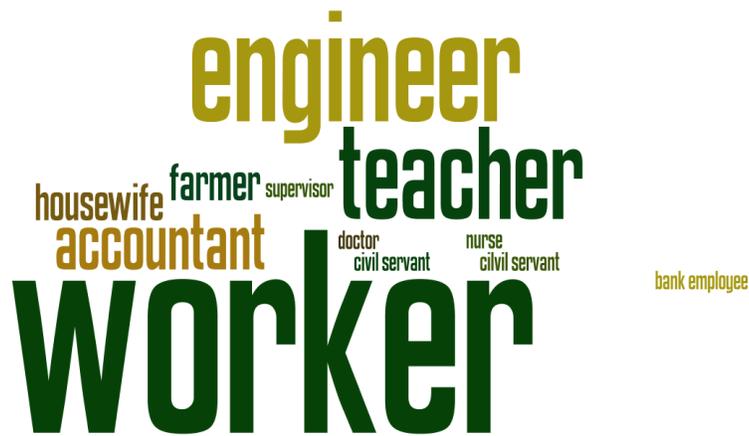


Figure 6.3 Residents' Former Occupation in Nanshan Charity Home

In Huishan Elderly Home, 52 respondents (81%) reported their overall health is good or excellent, 9 responders (14%) reported fair, and only 3 (5%) are poor. In Nanshan Charity Home, only 3 responders (9%) reported their overall health are good or excellent, 25 responders (71%) are fair, and 7 (20%) are poor and very poor (See Figure 6.4)

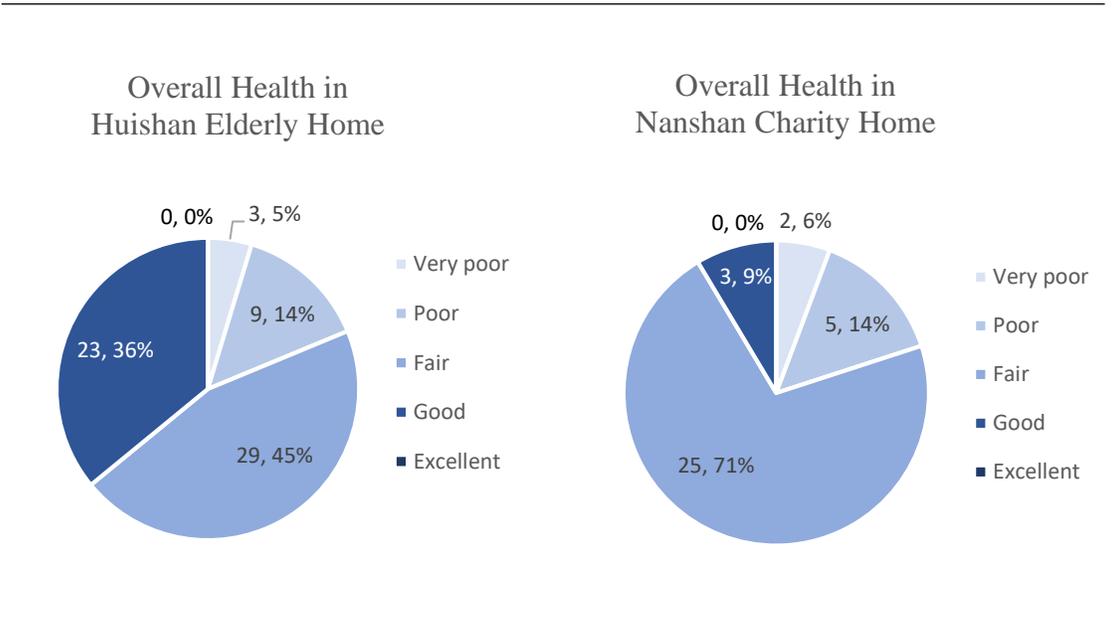
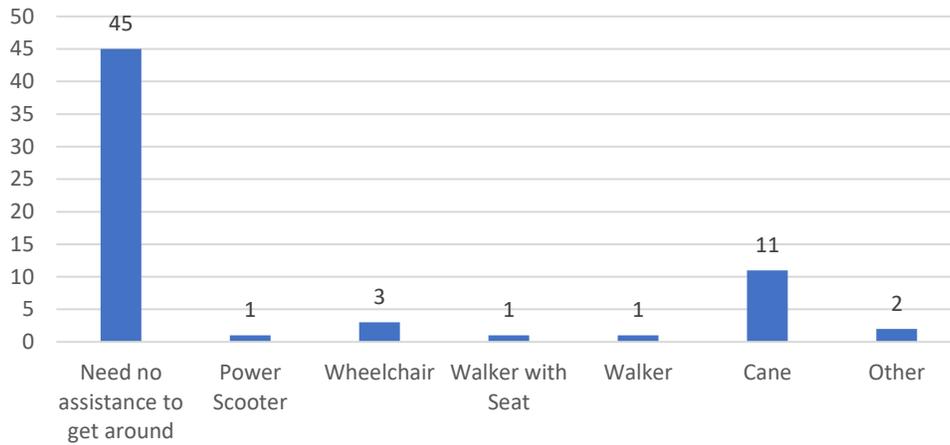


Figure 6.4 Residents’ Overall Health Condition

In Huishan Elderly Home, 45 (70.3%) respondents need no assistant to get around, 11 respondents (17.2%) need canes and 3 respondents (4.7%) need wheelchairs. In Nanshan Elderly Home, 22 (62.8%) respondents need no assistant to get around, 9 respondents (25.7%) need canes and 2 respondents (5.7%) need wheelchairs (See Figure 6.5).

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### Ambulatory Capability in Huishan Elderly Home



### Ambulatory Capability in Nanshan Charity Home

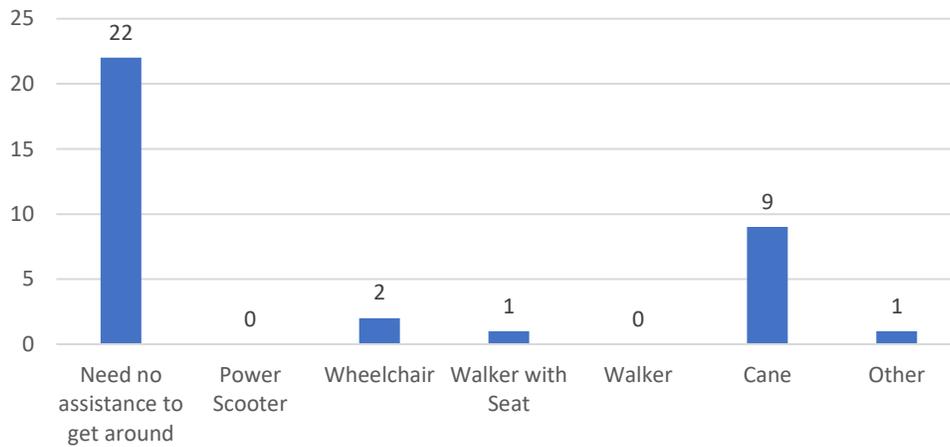


Figure 6.5 Residents' Walk Capability

### **6.3.1.2 Residents' Perception of Outdoor Space Usage**

In Huishan Elderly Home, 71.9% of respondents reported that the facility has the kind of outdoor areas they most enjoyed using, 68% respondents valued being able to spend time outdoors, and more than two thirds very much or somewhat like enjoyed spending time in outdoor areas.

In Nanshan Charity Home, 85.7% respondents reported that the facility has the kinds of outdoor areas they most enjoyed using, 74.3% respondents valued being able to spend time outdoors, and around than three quarters very much or somewhat like enjoyed spending time in outdoor areas (See Figure 6.6).

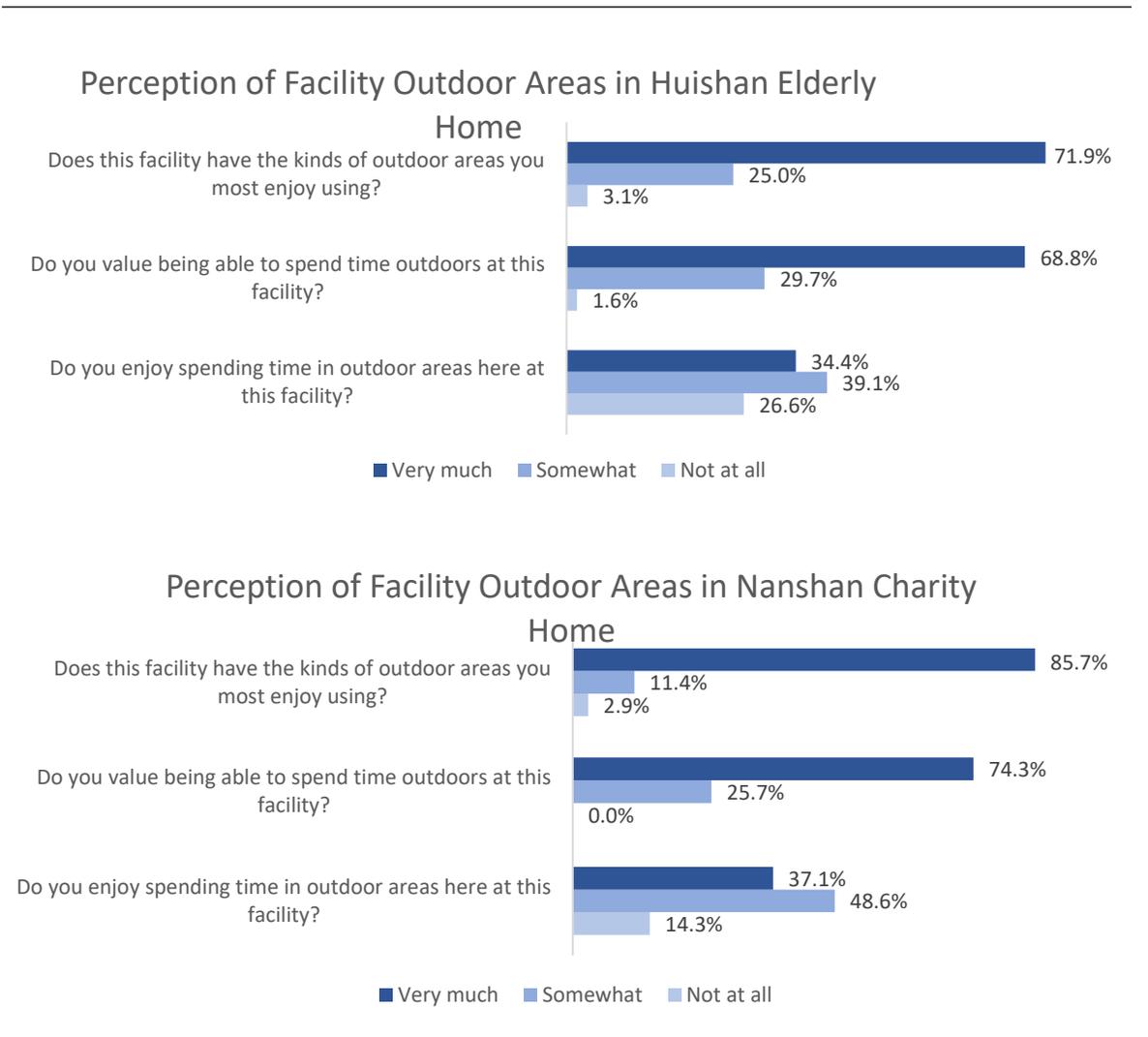


Figure 6.6 Perception of Facility Outdoor Areas

In Huishan Elderly Home, a high percentage of respondents reported that they feel better and have a good mood after being outdoors (See Figure 6.6). In Nanshan Charity Home, most people reported they really enjoy fresh air outdoors and gain a good mood after being outdoors (See Figure 6.7).



Figure 6.7 Feeling after Being Outdoors in Huishan Elderly Home

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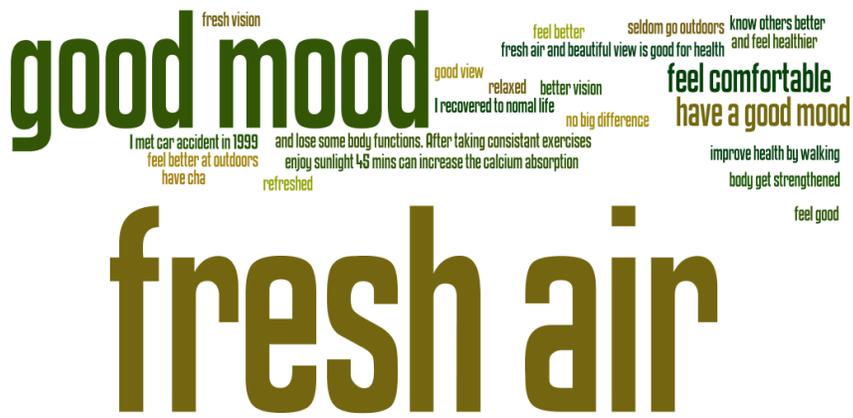


Figure 6.8 Feeling after Being Outdoors in Nanshan Charity Home

### **6.3.1.3 Residents' Outdoor Space Usage and Their Satisfaction of Outdoor Space Features**

In Huishan Elderly Home, 32 respondents (50%) use outdoor spaces every day when the weather is nice, 20 respondents (31%) use outdoor spaces more than once a day, and 9 (14%) use outdoor spaces less than once a week (See Figure 6.8). On average, 35 respondents (54.7%) stay outdoors equal to or less than 30 minutes, 19 (29.7%) stay between 0.5 – 1.5 Hours, and 10 (15.6%) stay more than two hours. The details can be found in Figure 6.9. By multiplying the frequency and duration, the results show on average each respondent in Huishan Elderly Home spends 442.8 minutes per week.

In Nanshan Charity Home, 11 respondents (31.4%) use outdoor spaces every day when the weather is nice, 8 responders (22.9%) use outdoor spaces more than once a day, and 7 (20%) use outdoor spaces less than once a week (See Figure 6.8). On average, 22 responders (62.9%) stay outdoors equal or less than 30 minutes, 11 (31.4%) stay between half an hour to one and half an hour. The details can be found in Figure 6.9. In Nanshan Charity home, each respondent spends 377.1 minutes per week on average.

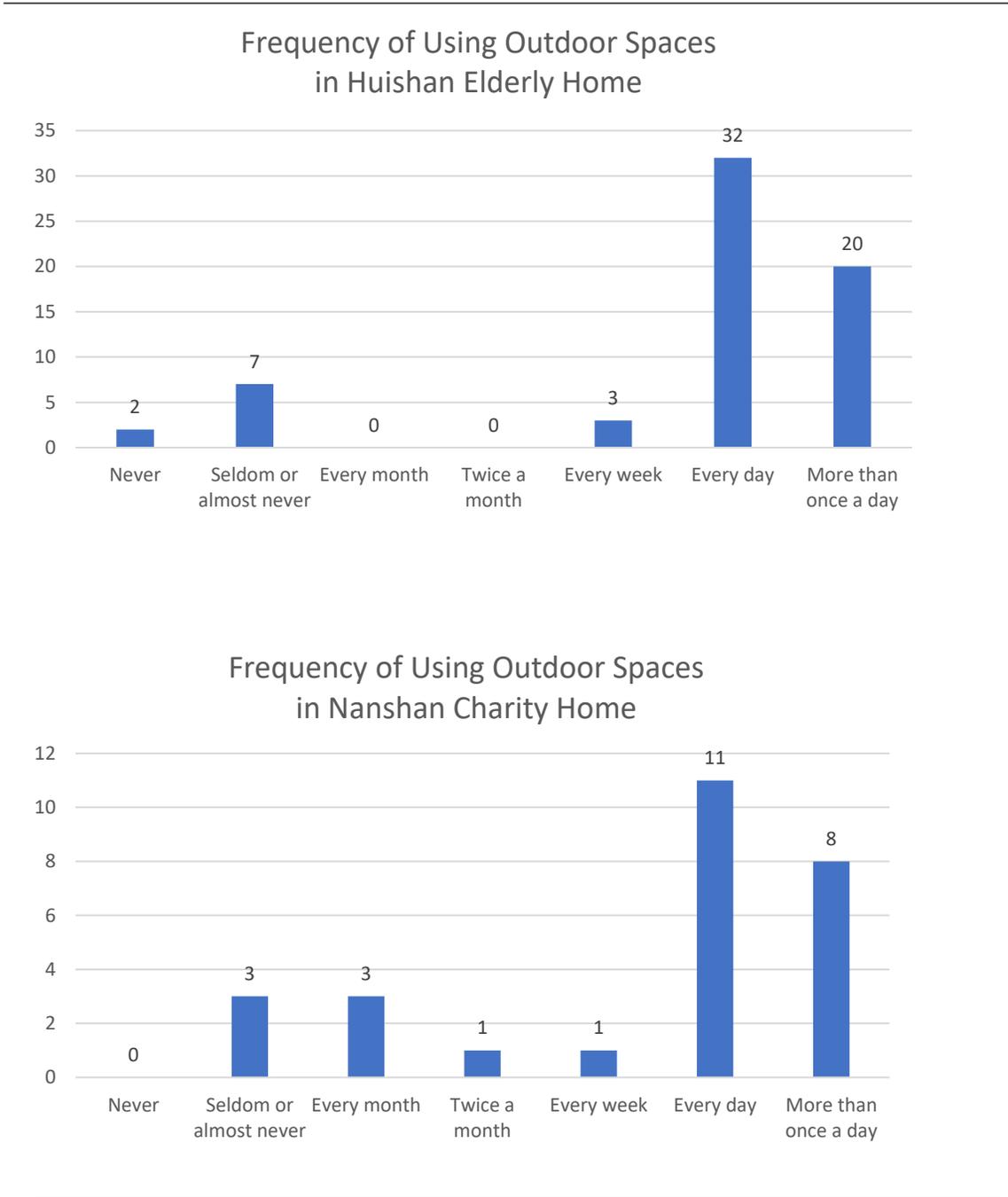


Figure 6.9 Frequency of Using Outdoor Spaces

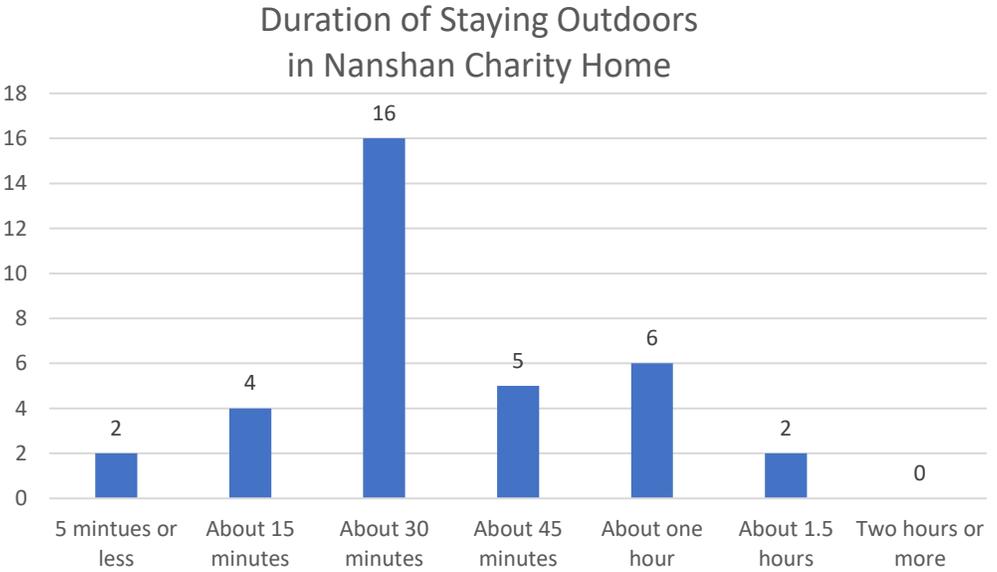
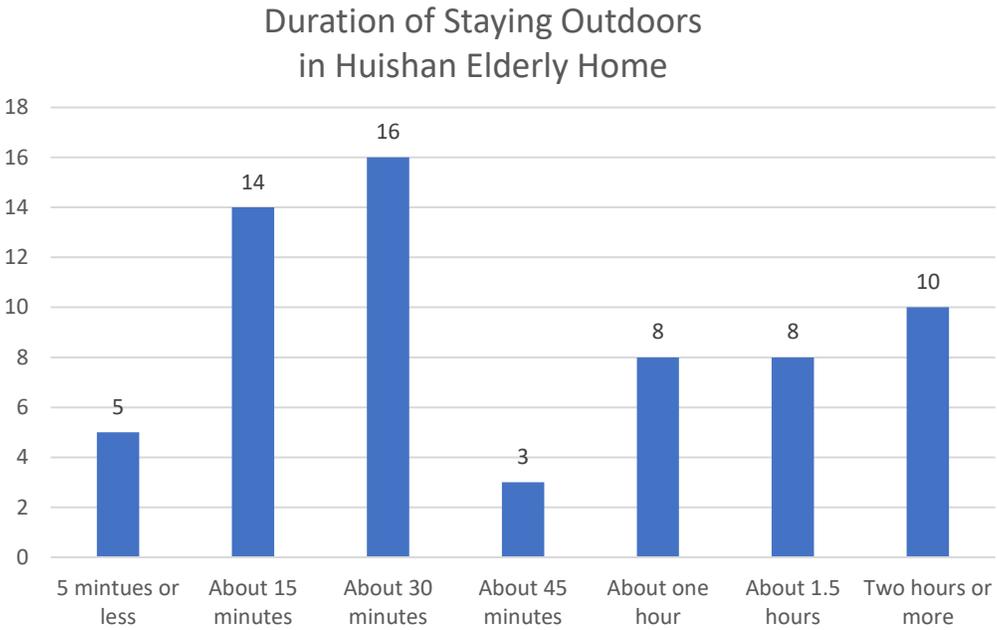


Figure 6.10 Duration of Time Outdoors

In Huishan Elderly Home, residents’ favorite places outdoors are the walkway, the plaza with the big umbrella, the gazebo and the covered path (See Figure 6.11). In Nanshan Charity Home, residents’ favorite outdoor activity is walking along the driveway (See Figure 6.12).

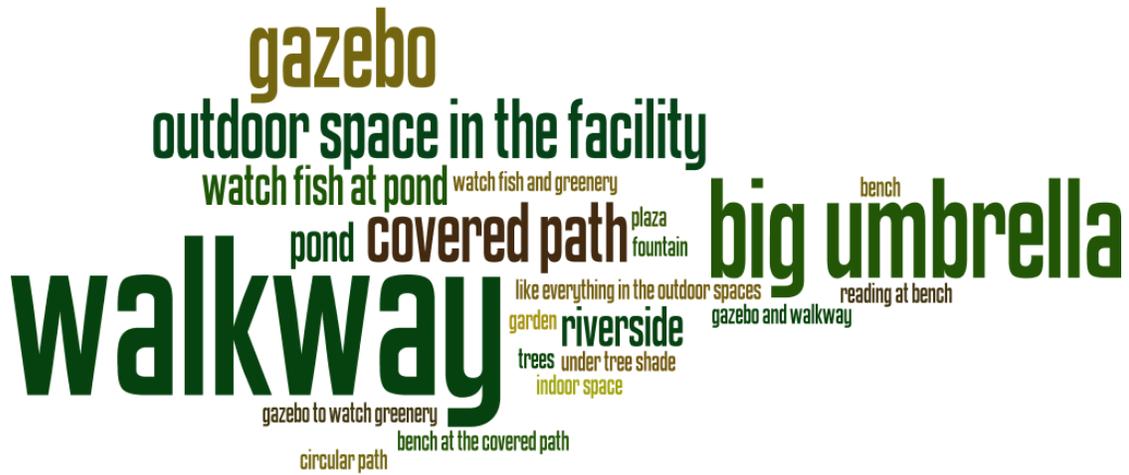


Figure 6.11 Residents’ Favorite Outdoor Place in Huishan Elderly Home



Figure 6.12 Residents’ Favorite Outdoor Place in Nanshan Charity Home

Among the entire outdoor features in Huishan Elderly Home, 37 respondents like the ponds, fountains and other water features most, 32 respondents like trees and greenery, and 19 like flowers. In Nanshan Charity Home, 22 respondents like greenery

most, 18 like flowers, and 18 like ponds, fountains, and other water features (See Figure 6.13).

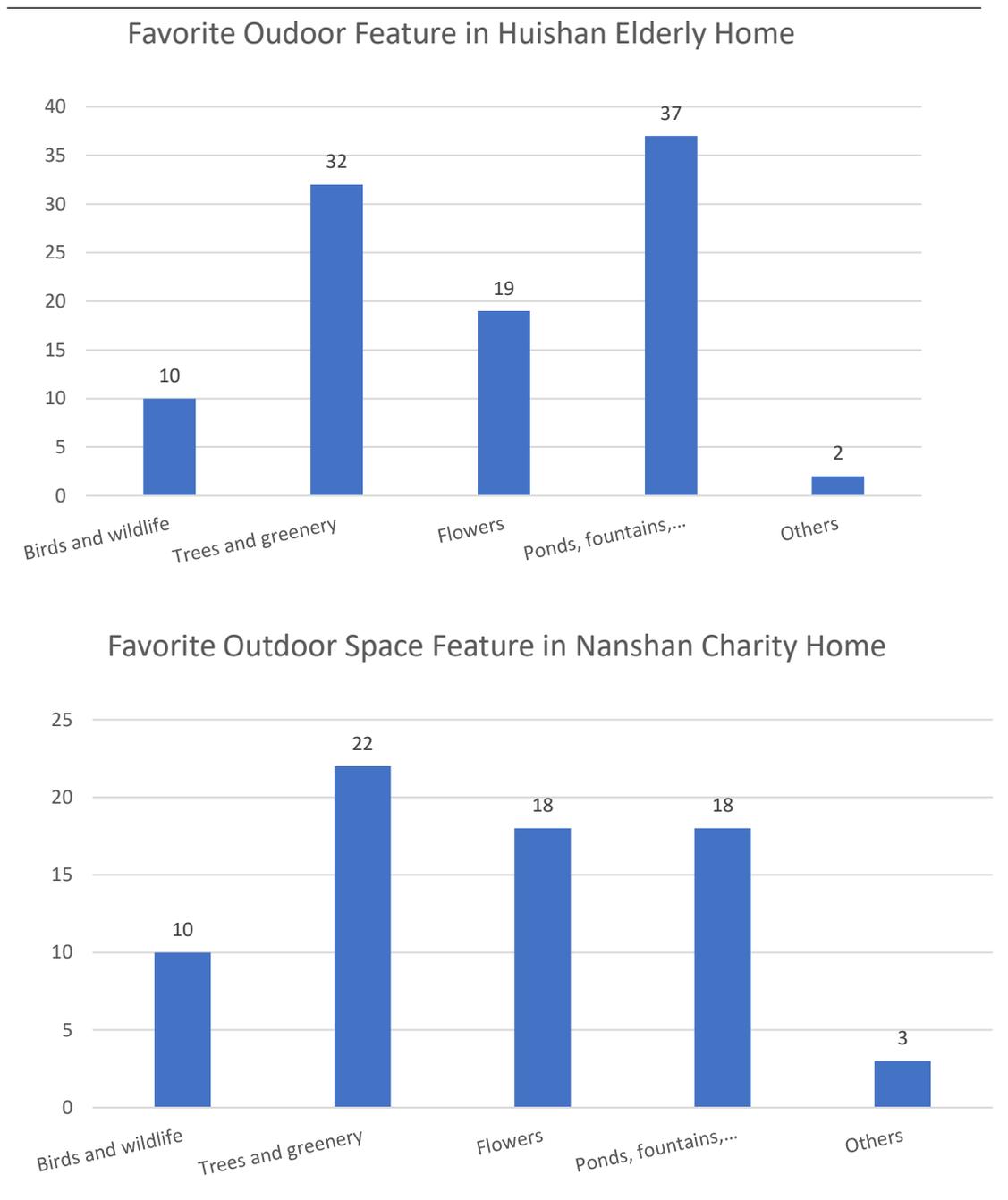


Figure 6.13 Favorite Outdoor Space Feature

In Huishan Elderly Home 71.9% and 75%, of the respondents believed that outdoor spaces at the facility and the walkways are very well designed separately. In Nanshan Charity Home 71.4% and 68.6%, of the respondents believed that outdoor spaces at the facility and the walkways are very well designed separately (See Figure 6.14).

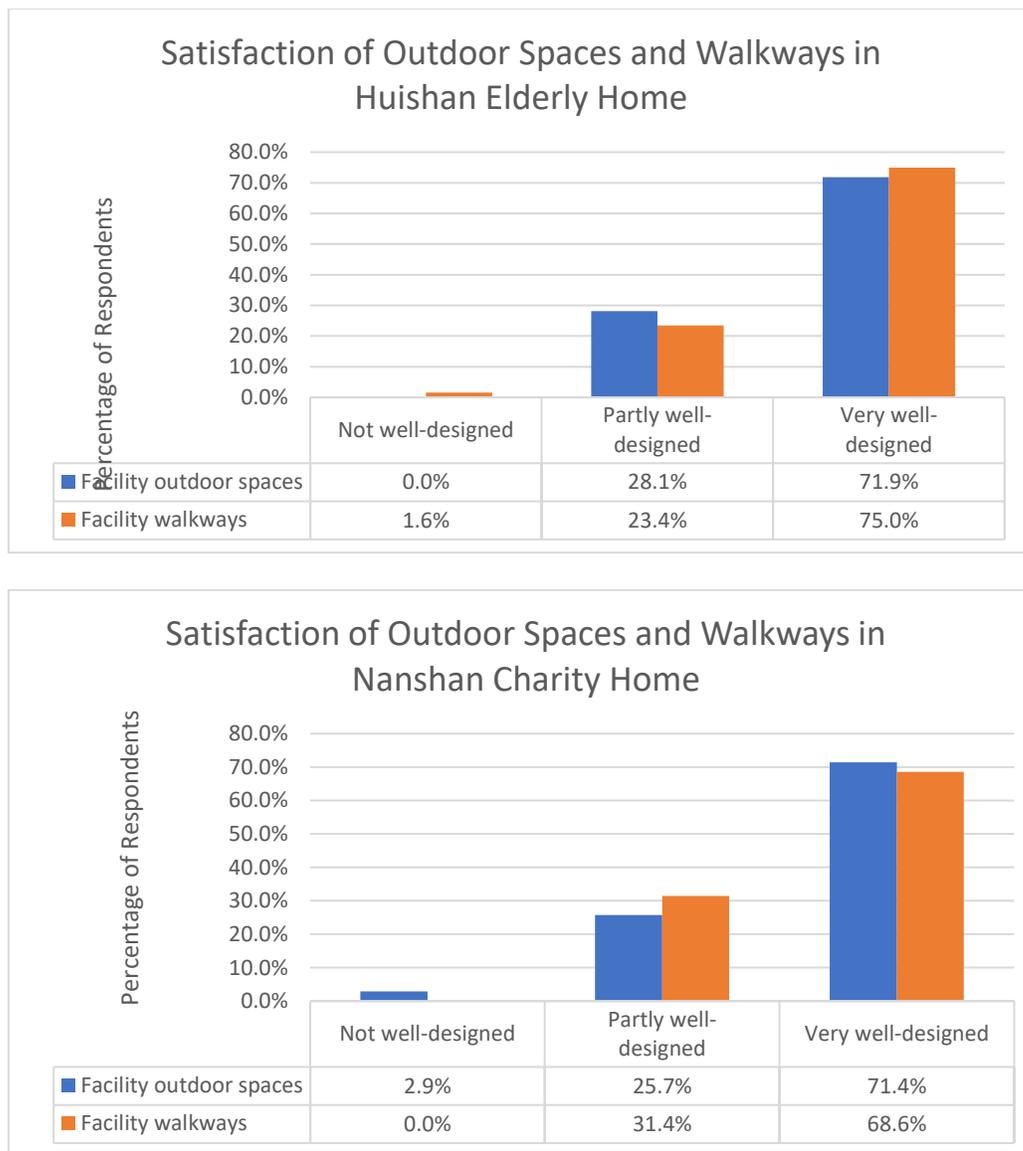


Figure 6.14 Satisfaction of Outdoor Spaces and Walkways

In Huishan Elderly Home, 23.9% of respondents were sometimes or often worried about falling when going outdoors, and 67.2% are bothered by smoking. In Nanshan Charity Home, 22.8% of respondents sometimes or often worried about falling when going outdoors, and 45.7% are bothered by smoking (See Figure 6.15).

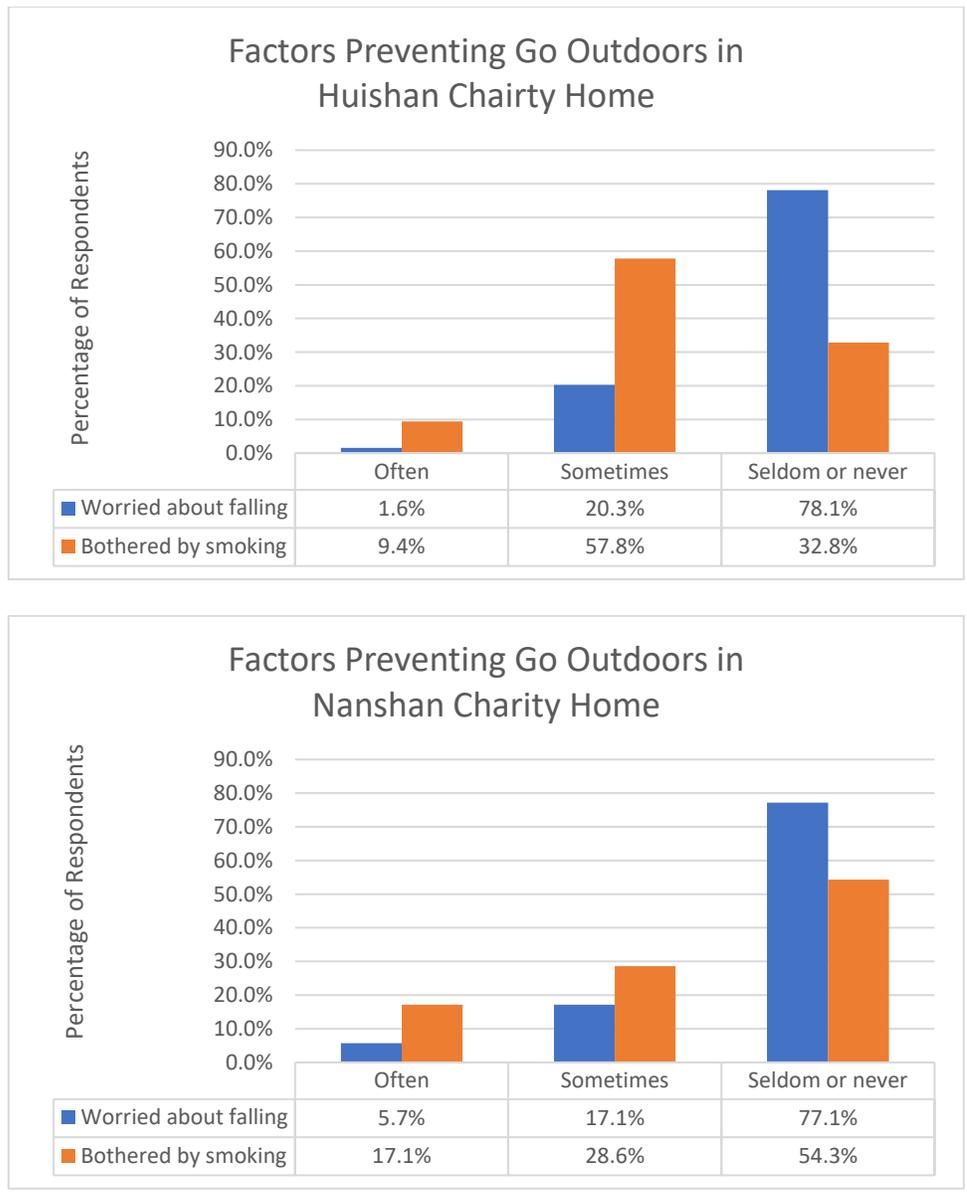


Figure 6.15 Factors Preventing Go Outdoors

## **6.3.2 Staff Questionnaire Results and Descriptive Analysis**

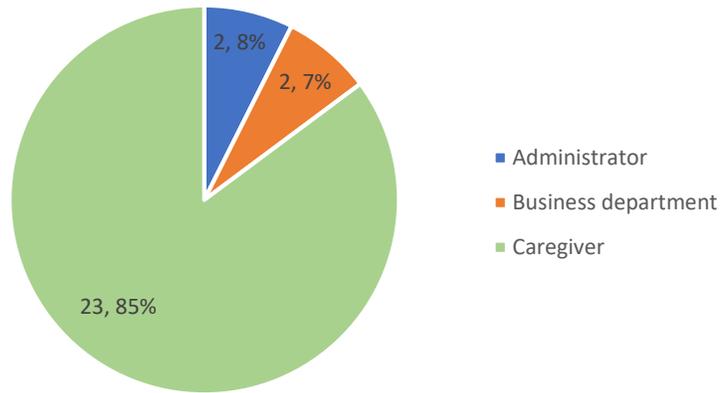
### **6.3.2.1 Staff Demographic and Work Profiles**

The 27 completed staff questionnaires from Huishan Elderly Home shows all of the respondents are female. Their ages are 41.3 on average. The oldest staff person is 50, and the youngest is 28. Their years of experience in the facility is 5.8 years on average. Of them, 23 (85%) are caregivers, 2 (8%) are administrators, and 2 (8%) work for the business department (See Figure 6.16).

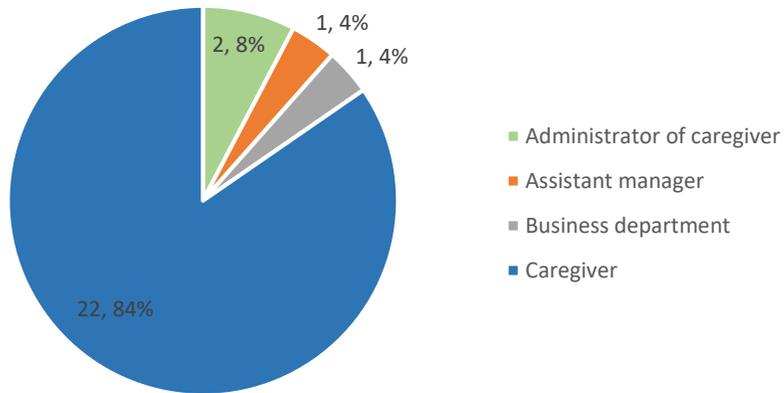
The 25 completed staff questionnaires from Nanshan Charity Home show 88% respondents are female. Their ages are 47.5 on average. The oldest staff person is 59, and the youngest is 29. Their years of experience in the facility is 3.3 years on average. Of them, 22 (84%) are caregivers, 2 (8%) are administrators, 1 (4%) is assistant manager, and 1 (4%) works for the business department (See Figure 6.16).

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Staff Positions in Huishan Elderly Home



Staff Positions in Nanshan Charity Home



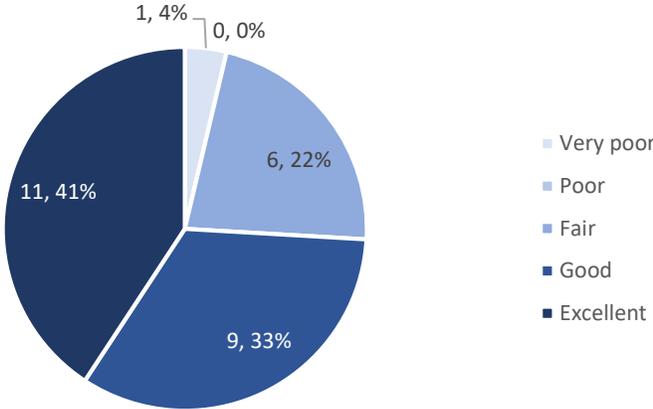
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Figure 6.16 Staff Positions

In Huishan Elderly Home, 20 staffs (74%) reported their overall health are excellent or good, and 7 (26%) are fair, poor or very poor (See Figure 6.17). In Nanshan

Charity Home, 19 respondents (73%) reported their overall health are excellent or good, and 7 (27%) are fair, poor or very poor.

Staff Overall Health in Huishan Elderly Home



Staff Overall Health in Nanshan Charity Home

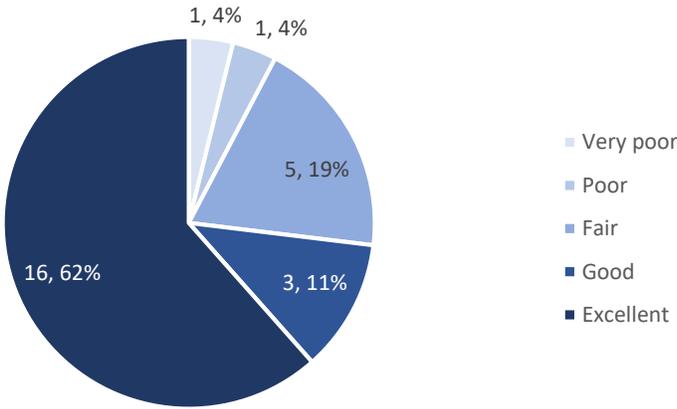


Figure 6.17 Staff Overall Health

### 6.3.2.2 Staff Observation and Perception of Residents' Outdoor Space Usage

According to staff reports, residents in Huishan Elderly Home spend an average of 511.6 minutes per week outdoors, and residents in Nanshan Elderly Home spend an average of 374.9 minutes per week outdoors.

Staff from Huishan Elderly Home reported residents spend the most time in the open space in front of the dining hall, gazebo, sunset plaza, and sunset avenue (See Figure 6.18). Staff from Nanshan Charity Home reported that residents spend the most time at the outdoor gym and the driveway (See Figure 6.19).



Figure 6.18 Places Residents Spend Most the Time in Huishan Elderly Home



Figure 6.19 Places Residents Spend Most the Time in Nanshan Charity Home

In Huishan Elderly Home, 26 respondents (96%) believed that going to outdoor spaces is mostly good or somewhat good for residents. They thought going outside can help residents exercise, enjoy fresh air, and relax, which is good for residents' health. However, 20 respondents (74%) reported they sometimes or often worried about residents going outdoors. The major concern is falling.

In Nanshan Charity Home, all respondents believed that going to outdoor spaces is mostly good or somewhat good for residents. They thought going outside can help residents to improve activities, have a good mood, enjoy fresh air, which is good for residents' health. However, 22 respondents (88%) said they sometimes or often worried about residents going outdoors. The major concerns including falling and safety.

### **6.3.2.3 Staffs' Outdoor Space Usage and Their Satisfaction of Outdoor Space Features**

In Huishan Elderly Home, staff respondents spent an average of 417.7 minutes per week in outdoor spaces. The major reasons they go outdoors is to accompany the elderly people, pass by, and improve activities. The major reasons preventing them from going outdoors are busy work schedules and inclement weather. Their favorite space is the sunset plaza.

In Nanshan Charity Home, staff spent an average of 252.8 minutes per week in outdoor spaces. The major reasons they go outdoors are for taking a walk and going outside for fresh air. The major reasons preventing them from going outdoors are busy work schedules and inclement weather. Their favorite space is the outdoor gym.

In Huishan Elderly Home, 81% of respondents reported they very much or somewhat care about having usable outdoor areas available, 93% said that the facility has the kinds of outdoor areas they most enjoy using, 85% valued being able to spend time outdoors, and 85% enjoyed spending time in outdoor areas.

In Nanshan Charity Home, 89% of respondents reported they very much or somewhat care about having usable outdoor areas available, all respondents said that the facility has the kinds of outdoor areas they most enjoy using, 92% valued being able to spend time outdoors, and 88% enjoyed spending time in outdoor areas (See Figure 6.20).

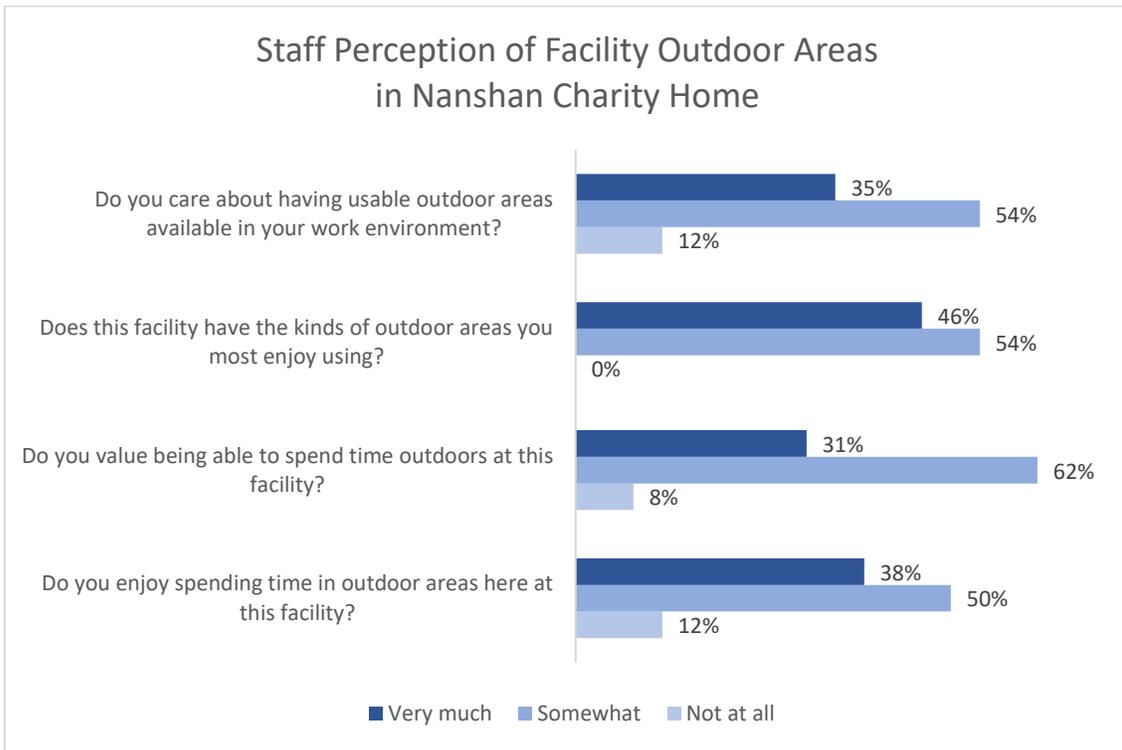
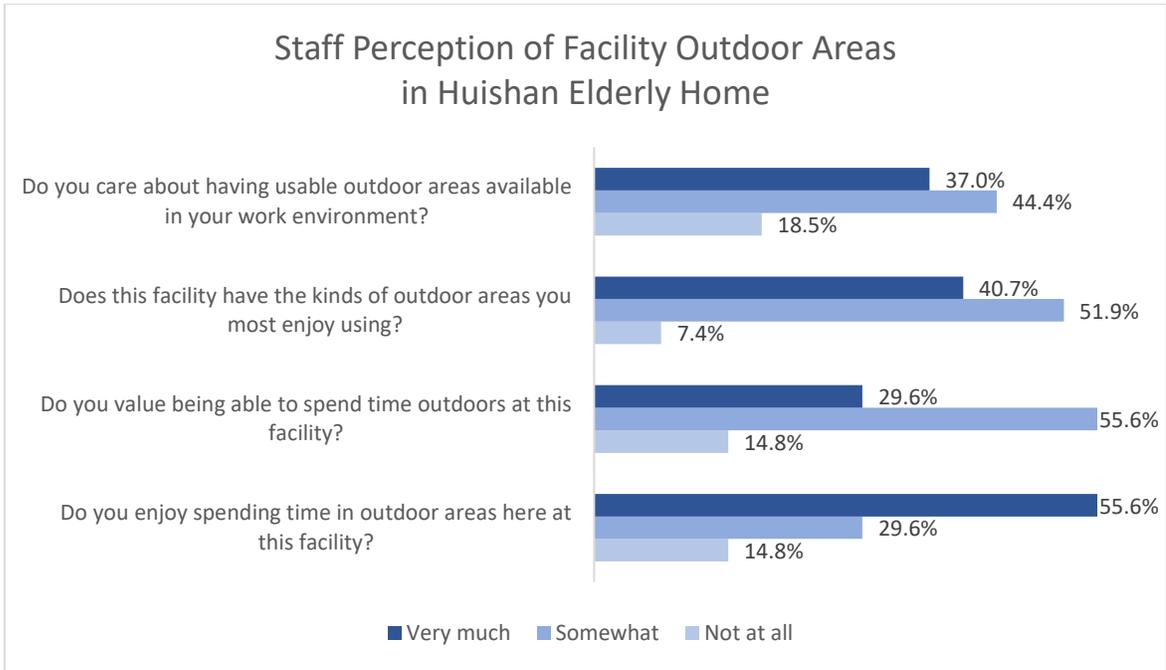


Figure 6.20 Staff Perception of Facility Outdoor Areas

In Huishan Elderly Home, all respondents are somewhat or very satisfied with outdoor spaces, and 96% are somewhat or very satisfied with indoor spaces. In Nanshan Charity Home, 89% of respondents are somewhat or very satisfied with outdoor spaces, and 89% are somewhat or very satisfied with indoor spaces (See Figure 6.21).

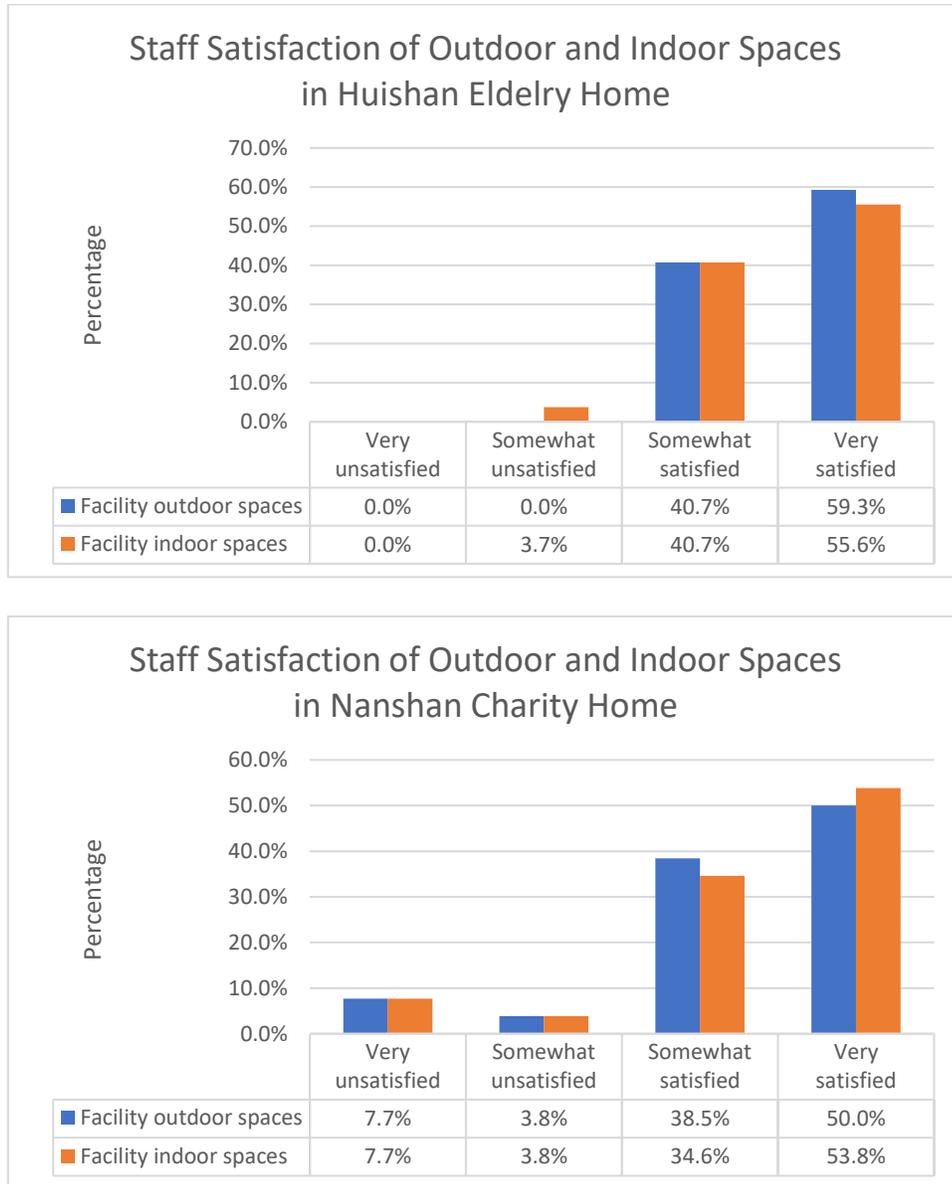


Figure 6.21 Staff Satisfaction of Outdoor and Indoor Spaces

#### **6.4 Discussion and Conclusion from the Questionnaires**

Most Responds in Huishan Elderly Home are male residents and were physical workers before their retirement. Their average age is 75 years old. 36% of respondents claimed to have good health conditions. 70% respondents needed no assistance to get around. In contrast, most respondents in Nanshan Charity Home are female residents and were non-physical workers before their retirements. Their average age is 83 years old. Only 9% respondents claimed they have good health conditions. And 68% residents needed no assistance to get around. In summary, residents in Nanshan Charity are majorly females, older and have weaker health conditions than residents in Huishan Elderly Home.

Similarly, most residents from both facilities valued and enjoyed spending time outdoors, and they all found the kind of outdoor areas they most enjoy using. The major reasons they go outdoors are for improving their mood, fresh air, and to feel better. Most residents go outdoors once or more every day and spend around 30 minutes. On average, residents in Huishan Elderly Home spent 443 minutes per week outdoors and resident in Nanshan Charity Home spent 377 minutes per week, which is less than Huishan Elderly Home. By considering Nanshan Charity Homes residents' older ages and weaker health conditions, their spending less time outdoors is understandable.

Residents from Huishan Elderly Home like to walk along walkways and spend time under the big umbrella. And Residents from Nanshan Charity Home like to walk along the driveway and spend time in the outdoor gym. Therefore, providing a walkway,

in the facility seems to be a very important element to improve residents' outdoor activities.

Residents from both of the facilities like trees, flowers, and water features, but have no strong preference towards any specific type. Contact with natural elements is one of the major reasons why residents spend time outdoors. Outdoor spaces which provide abundant trees, flowers, shrubs and at least one water feature may improve residents' time spent and satisfaction in using outdoor spaces.

More than two-thirds of residents from Huishan Elderly Home and one-half of residents from Nanshan Charity Home complained they are bothered by smoking. Smoking becomes a major reason that residents do not go to several outdoor spaces. Considering the strong smoking desires of some residents, providing a smoking room in the facility may relieve the problem.

The staff demographics and work profiles in both facilities are very similar, except that staff in Huishan Elderly Home have more years of experience in the facility. Staff from both facilities are in their 40s on average. Around 85% of the staff are caregivers, and the rest work for the administration department and business department. About three-quarters of the staffs reported their overall health are excellent or good.

Based on staff reports, residents in Huishan Elderly Facility spent 512 minutes/week to stay outdoor spaces in the facility. The number is a little higher than residents' self-reported data, which is 443 minutes per week. Staff reported residents like to spend time in the entry plaza, gazebo, sunset avenue, and sunset plaza, which matches the residents' report. Staffs in Nanshan Charity Home reported residents spend 375 minutes

per week, which is very close to residents' self-reported data of 377 minutes per week. They noticed residents spend more time in the outdoor gym and walking along the driveway, which matches residents' responses.

Almost all staff from both facilities believed that spending time outdoors would bring benefits to residents. However, most of them worried about residents going outdoors due to falling and safety. To effectively relieve the concern, a series of measures could be taken, including but not limited to providing a non-slip path with railing, offering a higher frequency of seating options to allow residents to take rests, and good facility layout with better visions and surveillance system to allow staff watch over residents.

In Huishan Elderly Home, the staff spends an average of 418 minutes per week outdoors. Most of them go to outdoor spaces in a passive way, such as accompanying elderly residents and passing through. They rarely go outdoors for personal reasons. In contrast, although staff in Nanshan Charity Home spent less time (283 minutes per week) outdoors, they actively go outside to take a walk and get fresh air. Staff from both facilities complained they have busy schedules and not enough time to go outside.

Most staff from both facilities valued and enjoy spending time outdoors. They also claimed the facilities have the kinds of outdoor spaces they like. Therefore, ways to more effectively arrange staffs' work schedule to enable them to take a short break outdoors is important.

## **7. FOCUS GROUP AND DISCUSSION**

### **7.1 Introduction**

Focus group interviews were applied to explore staffs' and elderly users' perceptions of opportunities and barriers that built environments provide to impact usage of outdoor space. The open-ended questions enable the interviewees to fully express their opinions without the limitation of pre-determined choices of answers (Turner, 2010). By conducting focus group interviews, researchers can obtain detailed information about participants' feeling, perceptions, and opinions from individuals and groups.

Focus groups are interviews where the group of people interacts with each other on specific topics provided by the researcher. Focus groups are helpful for collecting data from different people and collective perspectives simultaneously while easing the reluctance from people who feel uncomfortable to be interviewed on their own (Kitzinger, 1995). Many studies in the area of aging environment applied focus group interviews to collect qualitative information (Rodiek, 2006; Bengtsson, 2006).

The purpose of focus groups is to generate views and ideas via group discussion. The participants are encouraged to comment on each other's views, ask questions, and clarify ideas (Kitzinger, 1995). As group discussion is a critical element of focus groups, where the interactions among the group of people becomes essential.

When conducting focus groups, in order to encourage interactions, a lot of factors need to be taken into consideration. An important consideration is group size. It has been found that "the optimum size for a focus group is six to eight participants "

(Gill, Stewart, Treasure & Chadwick, 2008, p. 293) as it is a good balance between the right amount of discussion and the guiding influence required from the moderator or the researcher. Other factors include the schedule and the venue. Ultimately, the goal is to create a relaxing environment to reduce the participants' anxieties and facilitate the flow of discussion. The data generated from focus groups can be complex. The Analysis of focus group data involves realizing individual ideas, understanding the impact of group dynamics, and also giving attention to minority ideas.

Focus group are suited to the study of experiences and ideas within a giving cultural context (Kitzinger, 1995). It is a common qualitative research data collection method which offers different depth and insight to quantitative research.

## **7.2 Focus Group Strategy**

One resident focus group discussion and one staff focus group discussion were conducted on site, face-to-face in each facility. 12 -14 voluntary staffs in each facility who are interested in the topics of outdoor environmental features are recruited to participate the focus group. The administrations helped to advertise the focus group information and staffs are encouraged to participant in them. 12-14 voluntary residents who were both cognitively intact and physically mobile with or without aids, from each facility invited to participate in focus group discussions. Staffs helped to recruit voluntary residents by express the advertisement of focus groups. Residents are encouraged to participate in focus groups if they are interested in the topic. A semi-structured interview approach was applied in both resident interviews (See Appendix E) and staff interviews (See Appendix F). Participants responses to each question were

briefly written in transcripts. The entire discussion was recorded by using voice-recording software on an iPhone. The entire discussion was transcribed later word by word.

### **7.3 Data Analysis Procedure**

A qualitative content analysis approach was used to analyze the qualitative data collected from focus group interviews. First, the researcher should thoroughly read the interview transcripts multiple times and get extremely familiar with the context and understand each response. During this process, the research will be able to discover the overarching themes which naturally emerged. Researchers should determine a certain number of themes based on a few rules: 1) reflect the research purpose; 2) exhaustive contain all the important information in the interview; 3) themes should be mutually exclusive; 4) apply a single classification principle; and 5) allow to assign some particular words independently (Holsti, 1969; Jones, 1985). Each theme was later given names to reflect the central value of information in each category.

A constant comparative method, which is also known as grounded theory was also applied. It is a method to analyze data and therefore to develop a grounded theory. Instead of interpreting research data in a predetermined method, the constant comparative method helps researchers to generate ideas based on his/her initial understanding of the transcripts (Glaser & Strauss, 1967). In this way, the researcher can explore new ideas and suggestions from the collected information.

After thoroughly reading all the transcripts of focus group interviews from both facilities, four themes are determined, 1) access to nature, 2) outdoor comfort and safety,

3) walking and outdoor activities, and 4) maintenance. Each theme has its own color.

Data was coded and colored into the four themes. Figure 7.1 shows the theme color and

Figure 7.2 shows an example of color coding.

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Accessing to nature

Outdoor comfort and safety

Walking and outdoor activities

**Maintenance**

---

Figure 7.1 Theme Color

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I like the outdoor gym except the odors of rubber floor covering. The odor is a bit strong.

The outdoor greenery is very good.

The outdoor surrounding looks good as well as the indoor areas. However, our activities are limited to walking along the road, from the entrance to the back and then walk back to the outdoor gym due to the activity space size. I feel the quantity and types of flowers are not enough. There are many trees but limited flowers, so we do not see a lot of colors.

I get up around 5:00 am, and arrive at the outdoor gym at 5:30 am. I do two sets of Qigong exercise, and then two set of fitness dances, and other activities. I have tried the big loop, but I feel too tired to finish it, so I choose the short loops. Therefore, I wish there could be covered outdoor space for activities when it rains, otherwise, we can only stay indoors and cannot walk outdoor nor enjoy free air outdoor.

**It is necessary to have a regular maintenance for the equipment in the outdoor gym.**

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Figure 7.2 An Example of Color Coding

#### **7.4 Interview Results**

By applying the content analysis method, four descriptive analysis results were obtained, including one descriptive analysis of resident's responses and one descriptive analysis of staffs' responses from each facility.

#### **7.4.1 Results in Huishan Elderly Home**

One resident focus group interview and one staff focus group interview was conducted in Huishan Elderly Home. 12 staff and 12 residents volunteered to participate in each interview. The results are discussed below.

##### *Access to Nature*

###### Topic 1. Greenery

Most residents and staff highly valued the plants in the facilities. They were very proud of the varieties of trees, shrubs, and flowers, especially those with bright colors or scents. One resident reported the space with the tensioned membrane structures is one of his favorite outdoor spaces due to its lavish plants. He expressed “There is a big umbrella (tensioned membrane structure) and many varieties of flowers, trees, fruits. The circumstance is wonderful, ..., I really like that space (Resident 8). One staff proudly described the place as a beautiful park, she said “We like everything in the outdoors. You can come next spring and enjoy the flowers. I do not lie to you. I especially like sweet-scented osmanthus. It is very fragrant. I smell it when I enter the facility” (Staff 3).

However, some reported that several species of trees may cause allergy or pest problems. One staff member said “What we do not are the willow trees and poplar trees. They make us allergic. The white fluff goes everywhere when fall comes (Staff 3)”. One of her colleagues agreed and made one more point “This kind of tree is not good. There are many stinging caterpillars on those trees” (Staff 7).

## Topic 2. Block windows

Although most residents like plenty of plants, some complained that plants adjacent windows may block sunlight and views. One resident elaborated "... please do not add more plants. They are too lush and block the windows. It is too dark indoors. Everything is good except the cluster of bamboos. They should be planted away from rooms so we can see views from windows. Now the bamboo block views" (Resident 4).

## Topic 3. Fish pond

Many residents in the facility enjoy watching fish in the pond. Based on their reports, feeding and watching fish is a joy. One resident said "we watch golden fish around the fish pond. But we cannot see fish every time. So, we have a solution. We throw some steamed bread into the pond and then fish come up (Resident 11).

## Topic 4. Pets

Although the policy does not allow residents to keep cats and dogs, some residents kept feeding wild dogs and cats. The interaction with wild animals brought happiness to the residents. Some may never feed wild animals but watching others feeding the animals is joyful. One resident with shared me the story "some feed wild cats and dogs. I always see a man holding a bowl to feed a pregnant cat. Probably there are many baby cats. I thought they were baby dogs at the beginning. I always see a cat walking around the building. And that man pours food along the road. Those cats are good looking. Some have yellow fur, some are white and black. The old man always feeds them. I see everything from windows" (Resident 9).

## ***Outdoor Comfort and Safety***

### Topic 1. Seating

Residents discussed seating from perspectives of material, design, and layout. They suggested benches with backs and wood tops. One resident said “The bench tops are all made of wood. None of them are made of stone. The stone tops are cold. The wood top is comfortable for both summer and winter” (Resident 8). Another resident reported that several benches in the gazebo and along the road do not have backs (Residents 7). A staff really appreciated the benches under tree shades, she said “There are a few benches under the shade trees. We can sit there and chat and can watch over the residents” (Staff 3).

### Topic 2. Distance to Building

In the staff focus group interview, staff discussed why they use some outdoor spaces more often than others. One of the major reasons is the distance from the space to their workplaces. Staff usually choose outdoor spaces near the building and from where she/he can watch over residents. One staff explained why she always visited the Sunset Plaza but rarely went to the space with the tensioned membrane structure.

*It is close to the building. And it is related to our daily jobs. For example, we may pass the plaza to lead residents' visitors, and go to the administration buildings. The tensioned membrane structure is at the corner, and it is rarely related to our job. So, we rarely go there (Staff 8).*

## ***Walking and Outdoor Activities***

### Topic 1. Group exercises

Based on residents' reports, group exercise is one of the most important outdoor activities. Residents have different groups with different hobbies. Some like to sit and chat, singing and laughing, some do exercises like Tai Chi and group dancing, and some play goalball game and table tennis. Based on one resident's words,

*We have a goalball team. We play regularly and have the competition once a year. There will be group games next week. The winners will have a prize. They are suitable for elderly people. More male residents will participate in the games than female residents. Most female residents sit there and watch games. Yes, there are four tables tennis tables. We play all the time. And we have goalball game competition* (Resident 6).

### Topic 2. Staffs' outdoor activity

There are two major reasons for staff to have outdoor activities. The first is for work. Based on staffs' reports, they are very busy working and rarely have time to go outside. And they worry about many health consequences due to their responsibilities to watch over residents. One staff said "we do not take walks outdoors for personal benefit issue. We may go outdoors to take residents' medicine or something else and could go past the garden (Staff 5). The second reason is to move one's body after a long time of sitting. Another staff reported "We usually take a walk. We sit too much at work and want to move our body" (Staff 1).

## 7.4.2 Results in Nanshan Charity Home

Another resident focus group interview and one staff focus group interview was conducted in Nanshan Charity Home. 12 staff and 14 residents are volunteered to participant in the interviews. Because several comments from staffs' perspectives are similar and related with those from residents' perspectives, results of the two focus groups are combined together and discussed here.

### *Access to Nature*

#### Topic 1. Dead trees

Five dead trees in the facility seem to be a big issue that bothers residents. They strongly desired to have them removed for two reasons. First, dead trees look awful and make people feel ill. Second, dead trees occupied land which could be used for other purposes. One of the residents said:

*These trees have been dead for two years. There are many big trees along the river, and these five trees died recently. I suggest they be removed and consider carefully how to use the space afterward. Maybe plant trees, or flowers, or other vegetation. If the plan is to plant new trees, I suggest planting big trees but not small trees to maintain the visual consistency with other big trees (Resident 3).*

#### Topic 2. More greenery especially flowers

Providing abundant greenery is a critical feature in the outdoor spaces in long-term care facilities. Watching, touching, and smelling the vegetation are the major reasons residents like to spend time outdoors. One staff in the focus group interview mentioned

“We want some more greenery. It is good for residents’ health if they walk outside to take a look at the greenery and breathe fresh air” (Staff 3).

Among all the vegetation, residents mentioned flowers far more frequently than all the other kinds. Residents usually liked the bright color and strong scent of flowers. They adored a facility with flowers in all seasons, especially in places where they usually visit. Flowers surrounding seats are desirable, so they can watch, touch, and smell while in a seated.

One resident noted that “It is good to have flowers in all the season, especially around the seating. We like to smell the scent” (Resident 2). Another resident wanted some flower belt in the facility, especially in the open spaces between buildings. He said “Buildings are almost connected with each other, and the only open space is the central garden in front of Building 6. I noticed there are a lot of roses in the greenbelt along Xixing Road (the main road in front of the facility), the bloom every season and look pretty” (Resident 9).

### Topic 3. Aesthetic

Aesthetic is another requirement for planting design. Residents raised up that plants without a good layout are not desirable. Residents discussed how to make a good plant design. One resident expressed his idea as follows.

*Beauty is objective, and from my perspective, I like a combination of trees and flowers. Currently, the flowers are scattered in different places with a low aesthetic value. For example, it will be better to place two rhododendrons by a group of trees (Resident 6).*

#### Topic 4. Plant hazards

Senior adults are more fragile than younger people. Due to their fading senses, they may not be able to avoid the risks which may be inconsequential to younger people. Some plants are dangerous to senior adults. For example, plants with sharp edges should be avoided. Senior adults usually like to touch the foliage but cannot notice their sharp edges, which may lead to a hand cut. One resident gave an example,

*There is one problem with the grass. There is one type of grass (Miscanthus). It cuts hands when we touch it. It is ok to have more flowers, but this type of grass is not wanted (Resident 12).*

#### Topic 5. Block windows

Abundant greenery is usually wanted in a long-term care facility. However, these plants should not block windows. One staff member said, “The tree should not be too tall nor too close to the windows to block the sunlight” (Staff 8).

Residents spend a lot of time indoors, especially those with limited walking abilities. Enjoying sunlight and looking out the window are essential ways they contact with the outdoor environment. Therefore, plants that are taller than the windowsill should keep a distance away from the windows.

#### Topic 6. Fishpond

The fish pond is another topic in the staff focus group interview. There are two opposite opinions toward having a fish pond in the facility. One group of people believed that older adults like to watch and raise fish and fish ponds can encourage them

to spend time outdoors. While the other group of people argued that fish pond is a hazard which may cause elderly people fall in the water.

Staffs who support having a fish pond stated “It is good to design some fish ponds and raise fish. Old people like fish. We have a pond here which contains rockery and golden fish. The fish are raised very well” (Staff 6). Another staff proudly said that only high-end facilities can have a fish pond. She said “It depends on the level of the elderly homes. The low-end elderly homes do not have fish ponds” (Staff 2).

On the other side, several staff members are worried about the safety issues caused by fish ponds. One staff elaborated “It associates with the safety issue. Some elderly people who do not have clear mind may fall into the water. It could be dangerous if there is a fish pond” (Staff 12). Another staff gave an example of how dangerous a pond can be. “An elderly person in an adjacent neighborhood fell into the water when he walked along the river. Luckily, the river was shallow. It was too dangerous to have a fish pond” (Staff 13).

### ***Outdoor Comfort and Safety***

#### Topic 1. Seating

Seating is an important topic which residents discussed a lot from different perspectives, including quality, quantity, design, layout, and material.

Many residents reported that benches along the river are partially covered by soil, which leaves them with no clean benches to use. The riverside trail is designed for residents to take a walk. There are a few benches along the trail which should provide

seating opportunities for trail users. However, these benches sit on a sloped lawn and are partially covered by dirt and grasses. See Figure 7.3. The Many residents reported they do not use the trail because there are not enough seating opportunities.



Figure 7.3 Seating along Riverside Trail

One resident described his experience as following,

*The benches along the river partially sit in the soil, so we cannot sit there. It is a long way for us to walk from our facility to the river. We feel tired and need to sit and rest. (Resident 2)*

A second issue is the material of benches. Residents reported that they want some comfortable benches which should not too hot in summer nor be too cold in winter and would dry quickly after a rain. Although some residents express that the existing concrete and marble benches are acceptable by considering they could dry quickly and could last long, most residents express they want wood topped benches which make them feel comfortable.

One resident raised a possible solution to combine the two materials together. She said,

*The seating has to be carefully designed. Is it good to use wood as the seat top above the marble seats? And seats with a simple but quality back is also important to ensure elderly people can sit comfortably. I found a type of concrete seats with wood top and back is good. It does not feel good to sit on the marble seats, especially for elderly people (Resident 8).*

The third issue is the seating layout. Residents stated they want a variety of bench options in outdoor spaces with shade and sunlight. They said, “I want a place with benches to enjoy sunlight” (Resident 9) and “it is always good to have a variety of benches outdoors with shade and sunlight” (Resident 1).

Forth, seating height is another critical issue. Benches and chairs with suitable height are easier to use. Low seating may cause problems. One resident said “The bench should not be too low. Otherwise, we cannot stand up once we sit down” (Resident 12).

Fifth, there are not enough seating options in the facility. Many residents reported that a higher density of benches is required. Several residents complained that

they cannot find seating when they feel tired, which prevents them from going far. One staff said, “Those who use wheelchairs may not need seating, but the rest of the residents do need frequent seating places when they are outdoors” (Staff 1).

Lastly, residents expressed that they want seating options to allow a small group of people to sit and chat.

## Topic 2. Covered outdoor space

Residents reported they want a spacious covered outdoor space which allows them to go outside on rainy days. April to May is the wet season in Wuxi. In the two months, the climate is very comfortable and a lot of flowers bloom. However, the high frequency of rainy days prevents residents from going to outdoor spaces. One resident said,

*“we do not have enough outdoor activity spaces for rainy day usage. There is only one gazebo in the central garden. It is better to add some more outdoor spaces to sit and chat on rainy days”* (Resident 9).

Although there is a covered gazebo in the central garden, it is not spacious enough to accommodate enough people on rainy days. Figure 7.4 shows the gazebo in the central garden.



Figure 7.4 Gazebo in Central Garden

One resident elaborated “The gazebo in the central garden is too small to seat a lot of people. I suggest a covered space outdoors to allow people to sit outside on rainy days and enjoy time outdoors. It is not good to sit in a place without a cover” (Resident 10).

### Topic 3. Balance between sun and shade

Most residents want shade from trees in summer and sunlight in winter. Thus, making a balance between sun and shade is a critical issue which determines the residents’ outdoor usage. One resident raised a solution involving careful design with evergreen and deciduous trees. He said *the primary issue is making a balance to allow*

*greenery to provide shade in the summer while not blocking sunlight in the winter. Evergreen trees are good to provide shade, like camphor trees, however, they block sunlight in the winter, ..., people like sunlight in the winter and shade in the summer. You have to solve the contrast by carefully planning where to place evergreen trees, and where to plant deciduous trees (Resident 9).*

#### Topic 4. Still water

Waterscapes are welcomed by residents. However, how to design and maintain a clean and beautiful waterscape, especially for the still water is a big challenge. The still pond in the central garden and the still river close the riverside trail smell bad in summer, which prevent residents from using outdoor spaces nearby. In addition, the still water could be ideal breeding grounds for mosquitoes.

One resident explained the problems in this way,

*We have rocky mountains and streams at the entrance garden and the central garden. However, the still water is polluted, it smells and breeds a lot of mosquitoes. It can be improved from two ways, design a living water or improve the maintenance (Resident 14).*

Another resident expressed her opinion.

*This is a design issue. If there is still water, it could be a potentially polluted area. It requires the design to fit the site conditions. For example, the adjacent river is a still river, it smells bad. It is a critical issue to consider maintaining a clean, unpolluted body of water (Resident 8).*

## ***Walking and Outdoor Activities***

### Topic 1. Circular walkway

Circular walkways having a variety of lengths are important. Residents reported walking along the circular walkway is one of the most important daily exercise activities. Residents with different health conditions and walking habits have different requirements for the lengths of walkways. One resident said “this big loop is long. When I tried to walk the entire loop for the first time, I found it was a long way to finish the entire loop” (Resident 6). Another said, “I have tried the big loop, but I feel too tired to finish it, so I choose some short loops” (Resident 8).

### Topic 2. Spaces for group activities

Some outdoor spaces for group exercises are wanted. Many residents are interested in group exercised like Tai Chi, Qigong, and group dance. However, there is no outdoor space large enough to support the group exercise. One staff suggested,

*It is better if there is a spacious outdoor space that can accommodate a group of people. The outdoor space should have enough daylight. It could be used for group exercises and big events. We prefer to hold big events outdoors than indoors. It should be big enough. It is good for older adults to take a walk outside (Staff 11).*

### Topic 3. Outdoor gym

The outdoor gym in the facility is a popular place where many residents do a variety of exercises for fitness including Tai Chi, Qigong, or to socialize by just sitting and watching or chatting with others. Staff spends time in the outdoor gym doing fitness

activities after work or accompanying residents. One resident described his routine, “I get up around 5:00 am and arrive at the outdoor gym at 5:30 am. I do two sets of Qigong exercise, and then two set of fitness dances, and other activities (Resident 2).

### ***Maintenance***

Maintenance is the key to keep the outdoor spaces clean, aesthetic and functional. Residents reported many maintenance related issues, which were causing problems with plants, structures, road, and exercise facilities. One resident gave several very good examples.

*It is not easy to keep up good maintenance. It was good when I first came here, but it has become worse and worse. The road is always under construction, water pipes are always leaking. Because it has been repaired too many times, the road becomes uneven.*

*The greenhouse should not be removed but need to be rebuilt. It could be used to restore or grow plants in the winter. Many plants will die and cost too much if the greenhouse is removed. I think it is the maintenance issue. It is not professional. The maintenance people should have trimmed trees and weed grasses frequently.*

*The outdoor gym is a place for fitness. But the maintenance is not good, which is causing much of the equipment to become rusty. Good design will not work without proper maintenance (Resident 11).*

## 7.5 Discussion and Conclusions from the Interviews

Based on interview results in Huishan Elderly Home and Nanshan Charity Home, residents' and staff feedback towards outdoor spaces could be categorized into four domains, access to nature, outdoor comfort and safety, walking and outdoor activities, and maintenance.

### *Access to Nature*

There are five essential topics in the domain of Access to Nature could effectively influence how residents' and staffs' experiences in using outdoor spaces. The five topics are 1) a variety of greenery, 2) aesthetics, 3) plant hazards, 4) blocking windows, and 5) the fishpond.

- A variety of greenery

A variety of greenery is desirable in the long-term care facilities. Most residents and staff would like to see plenty of vegetation which are different species of trees, shrubs, flowers, and grasses. Among all the vegetation, flowers with bright color and pleasant scents are welcomed.

- Aesthetic

A well-designed planting plan could effectively enhance planting's visual quality. Outdoor space users' not only focus on the number of plants but also their aesthetic values. In addition, dead plants should be removed in a timely fashion.

- Plant hazards

Plants with hazards should be avoided. Due to residents' decreased senses, they hardly to notice and avoid some hazards brought by plants. Plants with sharp edges may cause cuts when touched, others cause allergies, and some pest hazards and should not be planted in the facilities.

- Block windows

Although a plenty of vegetation is desirable, the dense plants should keep a distance away from windows to avoid blocking windows. Window views and sunlight is important to residents, especially for those who spend a lot of time indoors.

- Waterscape

Waterscape is an amazing design feature which is loved by the residents and improves their time spent outdoors. For example, a fishpond is a wonderful feature to enable senior adults to watch and feed fish. However, the design of waterscape should consider safety and maintenance. Waterscape without proper maintenance or may cause foul smells and should be avoided.

### ***Outdoor Comfort and Safety***

- Seating

Seating could effectively influence residents' time spent in outdoor spaces and their satisfaction. A good seating design should be considered from different perspectives, including quantity, design, layout, and material. First, enough seats should

be provided in outdoor spaces at adequately close intervals. Second, seating design should fit older adults' needs, bench heights should be suitable, backs and arms should be included to help users to sit and stand up. Third, a variety of seating choices in outdoor spaces with shade and sunlight should be provided. Forth, seating surfaces should apply materials that are not too hot in summer nor too cold in winter and could dry quickly after a rain.

- Covered outdoor space

A spacious covered outdoor space is important to residents who want to spend time outdoors on rainy days. Due to the continuous rainy days in Wuxi in April and May, a covered outdoor space which could accommodate enough people could help residents spend more time outdoors.

- Balance between sun and shade

Because residents want sun in winter and shade in summer, a balance between sun and shade is important. One of the effective ways to achieve it is to control the ratio of evergreen trees and deciduous trees.

- Distance to Building

Due to staffs' tight schedule and responsibilities to watch over residents, they rarely go to outdoor spaces with much distance away from buildings for personal activities. They usually choose outdoor spaces adjacent to buildings and where they can watch over the residents. To engage staff to spend more time outdoors, the facility should provide at least one outdoor space with good sight lines near the buildings.

### *Walking and Outdoor Activities*

- Circular walkway

Circular walkways with a variety of lengths are important. Residents with different health conditions and walking habits have different requirements for the lengths of walkways. Benches and tree shade along the walkways are appreciated. In Nanshan Charity Homes, the driving loop is a very popular place which is treated as a circular walkway.

- Spaces for group activities

Group activities are one of the major outdoor exercises in both facilities. Residents have different groups with different hobbies. Some like to sit and chat, singing and laughing, some do exercises like Tai Chi and group dancing, and some play goalball game and table tennis. Therefore, several well-designed outdoor spaces for group activities are necessary for senior living facilities.

- Outdoor gym

Many residents and staffs spend time in outdoor gyms. Residents do a variety of exercises including fitness, Qigong in outdoor gyms. They believed that doing exercises is good for their health and mood. In addition, the outdoor gym becomes a place where residents can have social activities. They chat while each other while doing exercises or taking a seat and rest. Staff usually use the outdoor gym after work or watch over residents during work time.

- Staffs' outdoor activity

Staffs usually use outdoor spaces for two reasons, working purposes, and self-relax. Working purposes include watch over residents and go pass outdoor spaces. Some staff feels that walking in the outdoor spaces for a short while could help them to move the body, relieve tension, and get more relaxed.

### ***Maintenance***

Maintenance is key to keeping the outdoor spaces clean, aesthetic and functional. A well-designed facility without good maintenance can cause problems and even bring harm, including but not limited to dead trees, still water with a foul smell, broken facilities, and uneven paving. To eliminate these risks, continuous and high-quality maintenance is critical.

## **8. DISCUSSION, CONCLUSION, AND RECOMMENDATIONS**

This research study has examined the relationship between senior adults' outdoor space usage and accompanying satisfactions and environmental features in five domains, including accessing to nature, outdoor comfort and safety, walking and outdoor activities, indoor-outdoor connection, and connection to the world, in the Chinese context. A multi-method approach (triangulation approach) was applied in the study in six outdoor spaces in two long-term care Chinese facilities. This chapter discusses the findings by the different methods in relation to each other, in relation to the literature review, the key findings, and resultant design recommendations for outdoor spaces. In addition, a description of research limitation and the direction of future research will be discussed.

### **8.1 Summary of Findings**

#### **8.1.1 Findings from Environmental Audit (SOS)**

An environmental audit, SOS tool, was used to evaluate the supportive potentials six outdoor spaces' five domains in Huishan Elderly Home and Nanshan Charity Home. SOS scores of the six open spaces are tabulated in Table 8.1.

Table 8.1 Findings of Environmental Audit

	Outdoor Space	Access to Nature	Outdoor Comfort and Safety	Walking and Outdoor Activities	Indoor Outdoor Connection	Connection to the World	Average Score
Huishan Elderly Home	Space A	89	79	92	100	92	90
	Space B	81	77	90	100	95	89
	Space C	86	76	82	90	80	83
Nanshan Charity Home	Space D	84	71	88	97	95	87
	Space E	82	73	80	94	87	83
	Space F	88	77	86	80	89	84

### 8.1.2 Findings from Behavior Mapping

A total of 42 hours was used to observe outdoor space users' behaviors at six outdoor spaces in two facilities. The summary data of behavior mapping were tabulated in Table 8.2. A total number of 6926 people have been observed in the six spaces.

Table 8.2 Finding of Behavior Mapping

	Huishan Elderly Home			Nanshan Charity Home			<b>Total</b>
	Space A	Space B	Space C	Space D	Space E	Space F	
Walking with no aid	295	246	67	193	93	262	<b>1156</b>
Walking with aid	230	49	17	110	61	117	<b>584</b>
Pushing wheelchairs for companions	18	15	0	0	55	109	<b>197</b>
Sitting in wheel chairs	39	26	0	0	61	120	<b>246</b>
Sitting on seats	239	512	121	76	94	367	<b>1409</b>
Standing	210	309	41	146	97	44	<b>847</b>
Talking	252	295	17	72	78	132	<b>846</b>
Group Exercises	188	11	96	0	18	0	<b>313</b>
Individual Exercises	126	8	75	0	512	15	<b>736</b>
Watching or play with wildlife	158	0	23	315	0	56	<b>552</b>
Others	25	2	3	0	3	7	<b>40</b>
<b>Total</b>	<b>1780</b>	<b>1473</b>	<b>460</b>	<b>912</b>	<b>1072</b>	<b>1229</b>	<b>6926</b>

Figure 8.1 shows the total numbers of people observed in each space during the entire period of observation. It shows that Space A has the most people (1780), and Space C has the least (460).

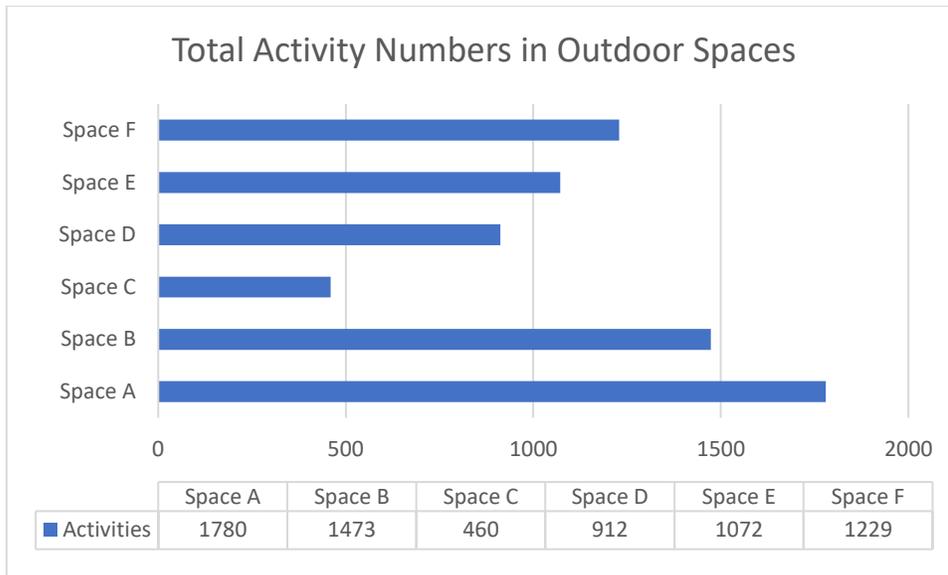


Figure 8.1 Total Activity Numbers in Outdoor Spaces

Figure 8.2 shows a variety of activities observed in all six outdoor spaces. The figure represents sitting on seats (1409 people) is the most frequent activity in facilities and walking with no aid (1156 people) is the second most frequent activity. Standing (847 people), talking (846 people), individual exercises (736 people), and walking with aid (584 people) are all popular activities in the two facilities.



Figure 8.2 Activities in Outdoor Spaces

### 8.1.3 Findings from Questionnaires

A total of 64 completed resident questionnaires were obtained from Huishan Elderly Home and 35 completed resident questionnaires were obtained from Nanshan Charity Home. From the results of residential questionnaires, several conclusions regarding residents' outdoor space usage and satisfaction can be found. They include:

1. In Huishan Elderly Home, residents spent an average of 442.8 minutes per week in outdoor spaces while residents in Nanshan Charity Home spent an average of 377.1 minutes per week in outdoor spaces.

2. Residents' favorite outdoor spaces include the walkway, the outdoor gym, covered paths, and gazebos. (*walking and outdoor activities*)
3. Residents' favorite outdoor features include trees and greenery, flowers, waterscapes, birds, and wildlife. (*access to nature*)
4. Most residents from both facilities felt outdoor spaces and walkways are very well designed. (*outdoor comfort and safety & walking and outdoor activities*)
5. Most residents reported the facilities have the kinds of outdoor spaces they most enjoy using.
6. Most residents reported they value of spending time outdoors.
7. Most residents said they very much enjoy or somewhat enjoy spending time outdoors in facilities.
8. Residents reported spending time outdoor makes them feel better, and creates a good mood, and enjoy the fresh air.

A total of 27 completed staff questionnaires were obtained from Huishan Elderly Home and 25 completed staff questionnaires were obtained from Nanshan Charity Home. From the results of staff questionnaires, a few items regarding Staff' outdoor space usage and satisfaction can be summarized. They include:

1. In Huishan Elderly Home, staffs spent an average of 417.7 minutes per week in outdoor spaces while staffs in Nanshan Charity Home spent an average of 252.8 minutes per week in outdoor spaces

2. Most staff are very much or somewhat care about having usable outdoor areas available.
3. Most staffs reported the facilities have the kinds of outdoor areas they most enjoy using.
4. Most staffs valued being able to spend time outdoors.
5. Most staffs are somewhat or very satisfied with outdoor spaces.

#### **8.1.4 Findings from Focus Groups**

Focus group interviews were held at Huishan Elderly Home and Nanshan Charity Home with both residents and staffs. One focus group interview was held in Huishan Elderly Home with 12 residents and one focus group interview with 12 staff. One focus group interview was held in Nanshan Charity Home with 14 residents and one focus group interview with 12 staffs. Findings of the four focus group interviews could be summarized into the four domains.

##### ***Access to Nature***

1. Residents expressed a desire to see a variety of greenery, especially flowers with bright colors and scents.
2. A well-designed planting plan which improves the plantings' aesthetic values is appreciated.
3. Plants with hazards, like sharp edge leaves should be avoided.

4. Dense plants should be kept away from windows to avoid blocking natural light and window views.
5. Waterscapes like a fish pond are welcomed by residents. However, maintenance and safety should be carefully considered.

### ***Outdoor Comfort and Safety***

1. Sufficient seating should be provided in outdoor spaces to allow residents to rest frequently.
2. A variety of seating choices in outdoor spaces with shade and sunlight should be provided.
3. Bench height should be appropriate for use by seniors having various physical challenges. Back and arms should be included to help users to sit and stand up.
4. Seating surfaces should use materials that are not too hot in summer nor too cold in winter and could dry quickly after a rain.
5. An appropriately large covered outdoor space is important to support outdoor group exercises and individual activities on rainy days.
6. A balance of evergreen trees and deciduous trees is needed to support the balance of sun and shade in different seasons.
7. Several outdoor spaces should be in close proximity to the buildings to allow staffs to use.

### ***Walking and Outdoor Activities***

1. Circular walkways with a variety of lengths are important to support residents' different needs to take a walk.
2. Several well-designed outdoor spaces large enough for group activities are needed.
3. The outdoor gym is an important place where both residents and staff can do exercise activities.
4. Staff usually use outdoor spaces for working purposes and self-relax.

### ***Maintenance***

1. Maintenance is the key to keeping the outdoor spaces clean, aesthetic and functional.
2. Maintenance work includes but not limited to removing dead trees, cleaning still water, fixing uneven paving, and rebuilding broken facilities.

## **8.2 Discuss Findings in Relation to the Each Other**

According to the findings from Environmental Audit, which is SOS tool and findings from behavior mapping, some relationship can be found. The results in Huishan Elderly Home are tabulated in Table 8.3, and the results in Nanshan Charity Home are shown in Table 8.4.

Table 8.3 Results from Environmental Audit and Behavior Mapping in Huishan Elderly Home

Outdoor Space	Space Area (acre)	Access to Nature	Outdoor Comfort and Safety	Walking and Outdoor Activities	Indoor Outdoor Connection	Connection to the World	People Observed
Space A	1.08	89	<b>79</b>	<b>92</b>	<b>100</b>	92	<b>1780</b>
Space B	0.45	81	<b>77</b>	<b>90</b>	<b>100</b>	95	<b>1473</b>
Space C	0.63	86	<b>76</b>	<b>82</b>	<b>90</b>	80	<b>460</b>

From Table 8.3, it is easy to find that the numbers of people observed in these outdoor spaces are related to environmental audit scores of three domains.

1. The number of people observed increase while the SOS scores of outdoor comfort and safety increase.
2. The number of people observed increase while the SOS scores of walking and outdoor activities increase.
3. The number of people observed increase while the SOS scores of indoor-outdoor connections increase.

According to a research study in 60 nursing homes in Milan, areas evaluated using the SOS tool showed no signification relationship between SOS scores and the size of the space (Fumagalli, Senes, Ferrara, Giornelli, Rodiek, Bardenhagen, 2016).

Similarly, no significant relationship among the size of the spaces, SOS scores and number of people observed was found in this research at Huishan Elderly Home.

Table 8.4 Results from Environmental Audit and Behavior Mapping in Nanshan Charity Home

Outdoor Space	Space Area (acre)	Access to Nature	Outdoor Comfort and Safety	Walking and Outdoor Activities	Indoor Outdoor Connection	Connection to the World	NO. of Activities
Space D	0.15	84	<b>71</b>	88	97	95	<b>912</b>
Space E	0.04	82	<b>73</b>	80	94	87	<b>1072</b>
Space F	0.23	88	<b>77</b>	86	80	89	<b>1229</b>

From Table 8.4, the only positive relationship between the number of observed people and SOS scores was found in outdoor comfort and safety. The number of observed people increases while the SOS scores of outdoor Comfort and Safety increase. No significant relationships among space areas, SOS scores, and the number of people observed were found in this research at Nanshan Charity Home.

From the findings of both questionnaires and focus group interviews, we can find that residents valued outdoor features in three domains, including access to nature, outdoor comfort and safety, and walking and outdoor activities. They reported having higher satisfaction levels while using outdoor spaces which have more supportive potentials in the three domains.

According to the findings of environmental audit (SOS), behavior mapping, and interviews (questionnaire and focus group), a summary of the findings and the research question results are tabulated in Table 8.5.

Table 8.5 Summary of Research Question Results

Research Questions	Results	Sub-research questions	Results
Q1. Will an outdoor area having a higher SOS score in the domain of <b>accessing to nature</b> be used more and have higher satisfaction survey results?	Partially Supported	a. Will an outdoor area having a higher SOS score in the domain of accessing to nature be <b>used more</b> ?	Supported
		b. Will an outdoor area having a higher SOS score in the domain of accessing to nature have <b>higher satisfaction survey results</b> ?	Supported
Q2. Will an outdoor area having a higher SOS score in the domain of <b>outdoor comfort and safety</b> be used more and have higher satisfaction survey results?	Supported		
Q3. Will an outdoor area having a higher SOS score in the domain of <b>walking and outdoor activities</b> be used more and have higher satisfaction survey results?	Partially Supported	a. Will an outdoor area having a higher SOS score in the domain of walking and outdoor activities be <b>used more</b> ?	Supported in Huishan Elderly Home Not support in Nanshan Charity Home
		b. Will an outdoor area having a higher SOS score in the domain of walking and outdoor activities have <b>higher satisfaction survey results</b> ?	Supported

Table 8.5 Continued

Research Questions	Results	Sub-research questions	Results
Q4. Will an outdoor area having a higher SOS score in the domain of <b>indoor-outdoor connection</b> be used more and have higher satisfaction survey results?	Partially Supported	a. Will an outdoor area having a higher SOS score in the domain of indoor-outdoor connection be <b>used more</b> ?	Supported in Huishan Elderly Home  Not supported in Nanshan Charity Home
		b. Will an outdoor area having a higher SOS score in the domain of indoor-outdoor connection have <b>higher satisfaction survey results</b> ?	Not supported
Q5. Will an outdoor area having a higher SOS score in the domain of <b>connection to the world</b> be used more and have higher satisfaction survey results?	Not supported		

### 8.3 Discuss Findings in Relation to the Literature Review

#### 8.3.1 Benefits of Spending Time Outdoors

Questionnaire results show that residents in both facilities think spending time outdoors can make them feel better, improve their mood, enjoy fresh air, feel physically better, and be more comfortable. The findings match the previous studies' conclusion that spending time outdoors can lead positive health outcomes (Godbey & Blazey, 1983; Holick, 1995; Humpel, Owen, & Leslie, 2002; Netz, Wu, Becker, & Tenenbaum, 2005;

Takano, Nakamura, & Watanabe, 2002; Rodiek, 2002, Tang & Brown, 2006, Ottosson & Grahn, 2006).

### **8.3.2 The Seniors' Outdoor Survey (SOS)**

The findings of this study suggest that four domains may be important in Chinese long-term care facilities. They are access to nature, outdoor comfort and safety, walking and outdoor activities, and indoor-outdoor connection. In addition, maintenance is also critical. Therefore, it is suggested to apply new five domains in environmental audit instrument for long-term care facilities in China. The new five domains include

1. Access to nature
2. Outdoor comfort and safety
3. Walking and outdoor activities
4. Indoor-outdoor connection
5. Maintenance

In this research, connecting to the world does not seem to carry the same importance as the five domains discussed above. The possible reasons could be the location and the layout of Chinese long-term care facilities. Unlike in the United States, most Chinese long-term care facilities sit in urban settings and usually have strong connections with the outside world. Huishan Elderly Home and Nanshan Charity Home are both adjacent to the local residential communities. Residents from both facilities could easily watch people living beyond the facilities. As a result, residents in the facility do not seem to need an additional connection to the outside world.

#### **8.4 Summary of Design Recommendations**

Based on the findings from focus group interviews, questionnaires, and site observation, residents' preferences for outdoor space features have been focused. The study findings indicated that outdoor spaces with some features are more likely to be preferred by residents. These features including abundant greenery, a variety of comfortable seating options, outdoor spaces for groups and individuals, wheelchair accessible walking loops, outdoor gym, and wildlife observation opportunity. They also expressed that the window should not be blocked by vegetation. In addition, staff interviews show that they have more opportunities to visit those outdoor spaces when they are adjacent to their working places.

##### ***Abundant Greenery***

One of the major reasons senior adults go outdoor spaces is to watch, touch, smell, and sometimes listen to and taste the trees, shrubs, flowers, and grasses. Residents like to be surrounded by abundant of greenery. Among all the greenery, residents like flowers most, especially those with bright colors and pleasant fragrance. One of the possible reasons is that bright color and pleasant fragrance can stimulate senior adults' fading sensory. Another reason is that lovely flowers help senior adults to feel beauty and vivid life.

The design of greenery can effectively influence the outdoor spaces' aesthetic value. It is better to make plantings in masses rather than to be over-scattered. Although residents seem like most of the plants in outdoor spaces, some plants with hazards

should be avoided, including but not limited to toxic plants, barbed plants, plants with sharp leaf edges, and plants may cause allergy.

### ***A Variety of Comfortable Seat Options***

Seating could effectively influence residents' time spent in outdoor spaces and their satisfaction. A good seating design should be considered from different perspectives, including quantity, design, layout, and material. First, sufficient seats should be provided in outdoor spaces. Second, seating design should fit older adults' needs. Bench height should be appropriate for seniors. Back and arms should be included to help users to sit and stand up. Third, a variety of seating choices in outdoor spaces with shade and sunlight should be provided. Forth, seating surfaces should use materials that are not too hot in summer nor too cold in winter and could dry quickly after a rain.

### ***Outdoor Spaces for Groups and Individuals***

A lot of group exercise has been observed in both facilities. Some residents were observed to be doing Tai Chi, Qigong, plaza dancing, and playing instruments in groups. It is suggested to provide spaces for group exercises in long-term care facilities to support the needs of group exercises. There could be several open spaces with different sizes to accommodate different sizes of groups.

In addition, some residents would like to escape from the crowd and need a quiet space to stay alone. To satisfy these needs, it is suggested to provide at least one quiet space away from the major buildings.

### ***Wheelchair Accessible Walking Loop***

Most of the walking activities happen on walkways. Therefore, the design of walkways, are essential to the users. There needs to be at least one looped walkway, although it is recommended to have several walking loops with different lengths. The looped path makes residents feel safe to go back and minimized to risk to get lost. In addition, residents have less stress is avoiding making a choice of which way to go. Moreover, they can choose how far away they would like to go by controlling the numbers of laps they do.

The walkway design should follow a few guidelines. First, it should be wide enough to accommodate at least one wheelchair and one accompanying person. Second, the walkway should be smooth and even enable wheelchair to access. Third, walkways surrounded by trees, flowers, and other natural features are more likely to be used.

### ***Outdoor Gym***

Many residents were observed using the outdoor gym. Most of them used the fitness equipment provided by the gym. Some used the open spaces between equipment to do exercise. And some group exercises were performed in the outdoor gym. In addition, some residents did not do any exercise used the space socially by, but only chatting and observing others exercising while they themselves sat on benches or in wheelchairs. Staff sometimes were found accompanying residents in the outdoor gym. They were also noticed to use the equipment a few times after work.

Based on the observations, it is suggested that the facility provide at least one outdoor gym with a variety fitness equipment that is suitable for senior adults. A few

open spaces could be provided in the outdoor gym for group and individual exercise. In addition, the outdoor gym is not only used as a place for exercises, but also a place for social interactions. Therefore, it is better to provide seating options to allow residents to rest, watch others, and communicate with others. Moreover, the outdoor gym should consider providing equipment for staff as well as residents.

### ***Wildlife Observation Opportunity***

Many residents were observed to watch fish in the pond in both facilities. Several residents were found to feed feral cats and watch butterflies. Several residents reported that watching wildlife is fun, makes them feel more alive and appreciative of the beauty of nature. Therefore, providing opportunities to observe wildlife may improve senior adults' time spent in outdoor spaces. Some ways to increase wildlife may include adding fish ponds and butterfly gardens.

A fish pond can be considered if site conditions allow. However, the safety measures for residents should be adopted, including but not limited to keeping the pond shallow and providing handrails. It is good to provide benches along the fish pond to allow residents to sit and watch the fishes.

### ***Access to Natural Light and Views through Windows***

Nature light, window views, and breezes from the windows are essential ways to connect people indoors with nature outdoors. It is especially important to those senior adults who spend most of their time indoors. To avoid blocking the windows, the dense

plants should keep a distance away from windows. Another benefit of keeping dense plants away from windows is to avoid bugs from plants getting into rooms.

### ***Proximity – Locating Outdoor Spaces Near Buildings***

Two groups of people in long-term care facilities preferred outdoor spaces which are adjacent to the buildings. The first group is residents, especially those who use walking aids and wheelchairs. An adjacent outdoor space is easier to access by eliminating barriers on the way. The second group is staff. Due to their responsibilities for residents' lives, they tend to worry about leave residents for a long time. On the other hand, they have the needs to be physically active and relax in outdoor spaces and have a short time to escape from work. Therefore, outdoor spaces nearby their workspaces could provide them the opportunity.

### ***Maintenance***

Maintenance is the key to keeping the outdoor spaces clean, aesthetic and functional. A well-designed facility without good maintenance can cause problems, including but not limited to dead trees, still water with foul smell, broken facilities, and uneven paving. In addition, a lack of maintenance can cause harm or injury. To eliminate these risks, continuous and high-quality maintenance is critical.

## **8.5 Recommendation for Design Improvement for Spaces**

Based on the observation of the site and interviews of users, a concept redesign of Space C in Huishan Elderly Home is proposed by applying the design recommendations developed in this research as shown in Figure 8.3. In the redesign,

some features are preserved and improved. The walking loops are widened to reach 5' wide to allow wheelchairs access easily. The umbrellas plaza is preserved and continues to perform as a group activity space. In addition to the original features, several new features are proposed. A butterfly garden is designed to allow senior adults to look, touch, smell, and feel the flowers and provide the opportunity to observe wildlife. A quiet space locating at the north corner allows residents and staffs to temporally escape from the crowds. An outdoor gym is proposed to provide spaces for individual fitness, group exercises, and social purposes. Canopy trees are planted along the path to provide shade. Movable wood top chairs with arms and back are provided along the path and at spaces where people want to rest, including the quiet space, the outdoor gym, the umbrella plaza, and the butterfly garden. People can choose to sit in the shade or the sunshine. All the paving materials should be smooth and even to meet ADA standards. Paving in the outdoor gym should be soft and ADA accessible to protect the users. The rubber and engineer fibers could be good choices.

Space D in Nanshan Charity Home is also redesigned by applying the design recommendations, which shows in Figure 8.4. The fish pond and the giant boulders are preserved. A wheelchair accessible deck is designed in front of the fish pond to provide spacious spaces for senior residents to observe fish and perform as a social space. Three umbrellas with coffee tables and movable chairs with arms and backs are designed to provide comfortable seating. Garden users can easily move the chairs to reform usable spaces. Railings along the fish pond are proposed to protect senior adults from falling into the water. The walking loop is reshaped, widened to reach 5', and repaved by using

smooth and even paving material to meet ADA standards. A butterfly garden is proposed at the east corner to provide flower and wildlife observation opportunities. Several movable wood top benches with arms and backs sit along the path. Canopy trees are planted in space to provide shade.

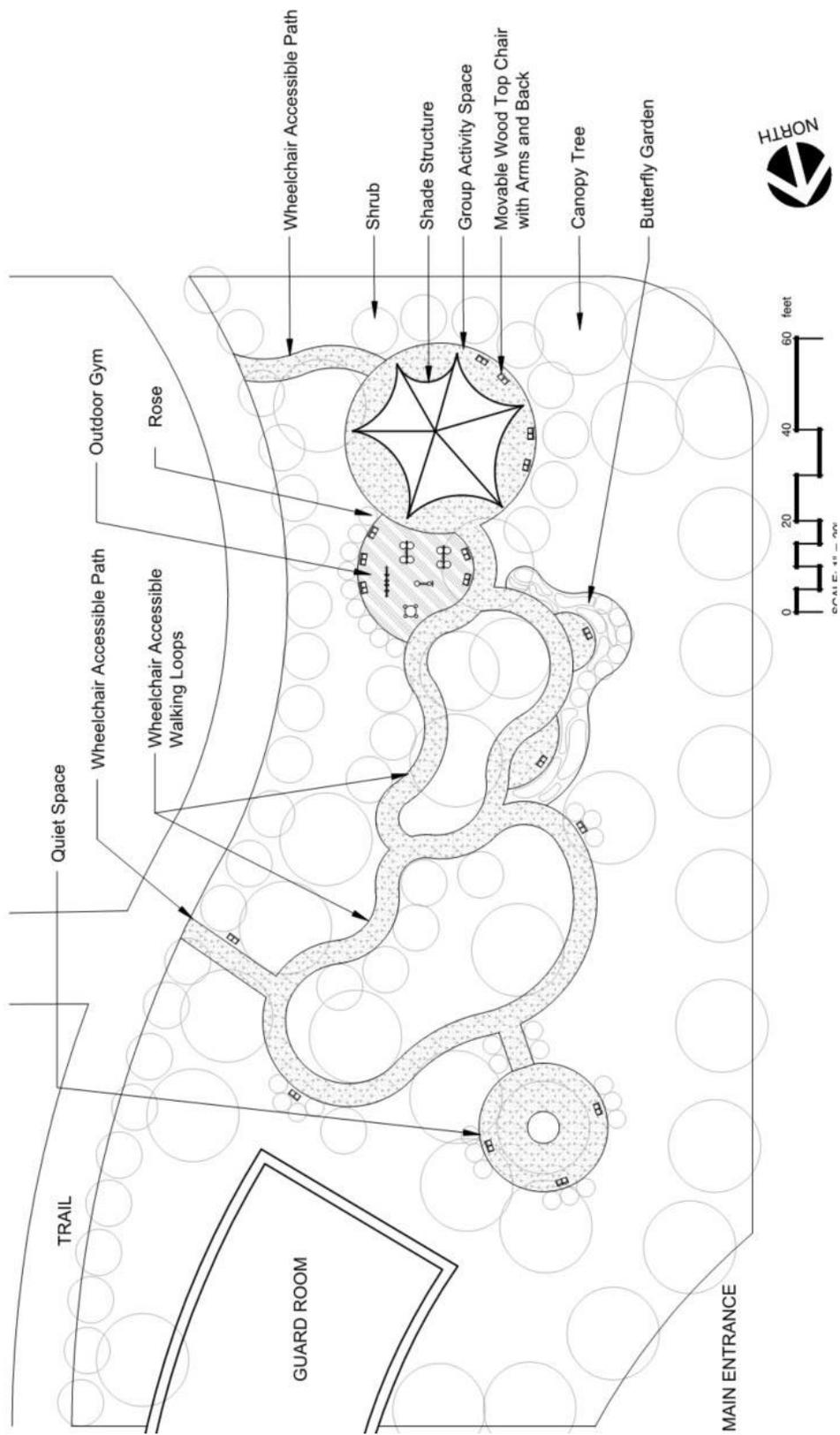


Figure 8.3 Redesign of Space C

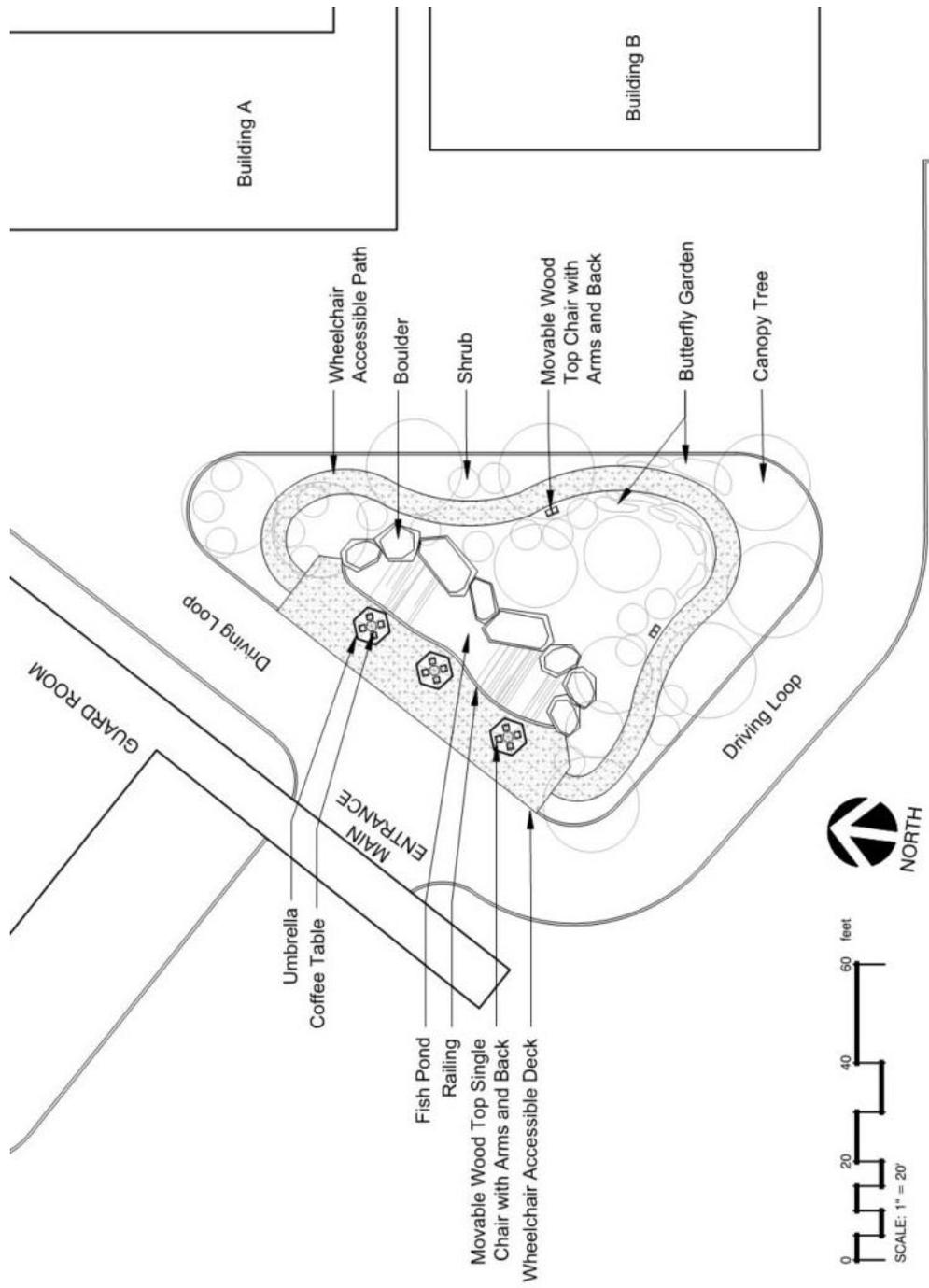


Figure 8.4 Redesign of Space D

## **8.6 Research Limitations**

The administration policy in each facility may influence the residents' outdoor usage and users' satisfaction, however, they are not included in this research.

Due to the nature of this research being a case study, it will be difficult to generalize the research findings. This research has limited numbers of facilities (two facilities) and outdoor spaces (six outdoor spaces) in China, which limits the generalizability of findings to China and these two assisted-living facilities.

Additionally, both facilities are in the same city with the same climate, which also makes it hard to generalize research findings, beyond their context.

## **8.7 Future Research**

Due to the shortage of funding and number of people, this study uses only two facilities, which limits the value of findings. Expansion of this study into more assisted-living facilities across a diversity of environments and cultural contexts will strengthen the power of generalization of the findings.

One purpose of this study is to contribute to the knowledge in the field of outdoor environmental design in Chinese long-term care facilities. The rapidly increasing demands of sound practices that improve elderly people's health and well-being in Chinese long-term care facilities and the growing requirements of evidence-based design both call for increased research specifically in Chinese long-term care facilities in the future.

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## APPENDIX A

### SUMMARY OF RESEARCH IN AGING ENVIRONMENTS

<b>Year</b>	<b>First Author</b>	<b>NO. of Facilities</b>	<b>NO. of People</b>	<b>Methodology</b>	<b>Main Findings</b>
2006	Cutler	40	1988	Environmental checklist Interviews Observational study Survey of Quality of Life	55% of the environments of the 131 units had no item featured on the outdoor amenities index. Two third of residents who were physically capable to go outside choose to do so less than once a month.
2006	Bengtsson	3	88	Focus group interviews	Sensitivity to weather, security, familiarity, and calmness make elderly feel comfortable in the outdoor environment. Capacity for outdoor activity, sensual pleasure of nature, following the rhythm of life in nature, surroundings as a way to keep up to date, contact with people and society outside, surroundings as a source to relate to past items, and social potential of outdoor environments encourage elderly to access to surrounding life.
2006	Rodiek	14	108	Questionnaire Survey Focus group	Attractions of built environmental elements: overhead shelter, sitting areas, porches, gazebos, walking loop, swings, indoor features, Attractions of natural elements: greenery, fresh air, flowers, birds, water features, sunshine, animals

Continued

<b>Year</b>	<b>First Author</b>	<b>NO. of Facilities</b>	<b>NO. of People</b>	<b>Methodology</b>	<b>Main Findings</b>
2006	Rodiek	14	211	Focus groups Written surveys Photographic comparisons	Residents appreciated outdoor features such as walkways, shade, seating, greenery, and views
2009	Rodiek	68	1560	Survey Questionnaire	High accessibility, clear indoor-outdoor connections, safe paving, good maintenance, round-trip walkways, and a choice of comfortable sitting areas with appealing views associated with increased outdoor usage
2011	Davis	1	38	POE Behavioral observation and mapping Interviews Survey Questionnaires	The designer and administrative staff perceived high accessibility while patients and staff reported low accessibility. Patients reported high satisfaction with the garden while staff reported little time for garden use. Poor maintenance decisions resulted in decreased functional and aesthetic value.
2010	Stigsdotter	N/A	11238	Face-to-face interview Self-administered questionnaire	There is an association between distance to a green space and health-related quality of life. Green spaces may be important in managing stress. Green spaces may play an important role as health-promoting environments.

Continued

<b>Year</b>	<b>First Author</b>	<b>NO. of Facilities</b>	<b>NO. of People</b>	<b>Methodology</b>	<b>Main Findings</b>
2011	Cheng	6	46	In-depth semi-structured interviews	Some elderly feel isolated and depressed after their relocation. Each RCF, as a place with its unique physical and social environment, has a significant influence on the elderly residents' physical and psychological well-being.
2013	Crisp	N/A	517	Postal surveys Questionnaires	Provision of outdoor living areas, support in maintaining independence, assisted living facilities, and accessibility to medical encourage relocation. Luxury services are at least likely to encourage relocation. A fear of losing independence and privacy most influential in discouraging relocation.

## APPENDIX B

### SENIORS' OUTDOOR SURVEY (SOS) TOOL

#### SENIORS' OUTDOOR SURVEY (SOS)

©2014, Susan Rodiek, Center for Health Systems & Design, Texas A&M University, College Station, TX



Your Name, Location \_\_\_\_\_

Which Outdoor space? \_\_\_\_\_ Date/ Time \_\_\_\_\_

#### PLEASE READ before using this tool:

**STEP 1:** Choose an outdoor area – First, decide on the boundaries of the outdoor space to be evaluated. (Features that are viewable should be included when appropriate, even if beyond the space itself.)

**STEP 2:** Walk and sit in the area - Imagine YOU are a senior resident with sensory and functional disabilities, using a walker or wheelchair. Walk around slowly, test the furniture, look at the area from different positions – including wheelchair height.) ASK: “How well does this space support the needs of frail older adults?”

**STEP 3:** Evaluate the area – Rate each item from 1 to 7 (1 = worst, 7 = best), based on the climate, context, and functional level of residents, considering what you could *reasonably expect* in this type of setting. If there are several features in an item, rate overall how well they support outdoor usage.

**OVERALL**, how well does this outdoor area provide a real sense of escape and relief from being indoors? (a feeling of fresh air, views, sky, sunshine, lush plantings, other senses) Very well \_\_\_ Fairly well \_\_\_ Not well \_\_\_

#### 1. ACCESS TO NATURE (14) Subtotal \_\_\_ ÷ 14 = \_\_\_ Score for this category

- Abundant greenery - Does this area include or view a substantial quantity of healthy green plants \_\_\_; with a diverse mix of trees, vines, flowers and shrubs \_\_\_? (instead of all hard paving, or just a few types of plant)
- Flowers and color - In season, would residents see an abundance of color, as flowers or bright foliage \_\_\_?
- Reachable plants - Can residents in wheelchairs see, touch, or smell attractive plants at hand or eye level \_\_\_?
- Viewscapes - Does seating have pleasant views \_\_\_, and are hard boundaries partly screened by plants \_\_\_?
- Water and motion - Can residents see, hear, or interact with water, such as fountains, ponds, birdbaths, etc. \_\_\_? Do any features have movement \_\_\_? (e.g., wind chimes, waving banners, spraying fountains, grasses moving in the breeze)
- Wildlife/ pets - Does this area provide amenities for pets \_\_\_; or to attract wildlife, such as squirrels, birds, and butterflies \_\_\_; or does it have views of domestic or farm animals \_\_\_? (such as rabbits, chickens, grazing cows or horses)
- Private and quiet - Is the garden overall fairly quiet, and free from obnoxious noises \_\_\_; with privacy from nearby resident rooms \_\_\_; and at least one or more private outdoor places to sit \_\_\_?

#### 2. OUTDOOR COMFORT AND SAFETY (15) Subtotal \_\_\_ ÷ 15 = \_\_\_ Score for this category

- Available seating - Is there plenty of seating available \_\_\_; with at least a few different types of seating \_\_\_?
- Sitting choices – Are there places to sit in sun or shade \_\_\_; with some seating easily movable by residents \_\_\_?
- Safe seating - Is the seating stable so it will not tip over \_\_\_; with backs and arms to help residents get up safely \_\_\_?
- Sitting comfort - Are chairs and benches comfortably shaped \_\_\_; made of materials that do not get too hot or cold \_\_\_; with at least some seat cushions \_\_\_?
- Sitting amenities - Are there tables near some of the seating, to place a cup of coffee or food \_\_\_; and are there any rocking chairs, swings or gliders available \_\_\_?
- Restroom/ drinking water - Is there a nearby restroom, with access to a drinking fountain or water cooler \_\_\_?
- Maintenance/ air quality/ climate control - Is the outdoor area well-maintained \_\_\_; are any smoking areas well-separated from other areas \_\_\_; and is there any microclimate control \_\_\_? (e.g., outdoor fans, heaters, etc.)

**3. WALKING AND OUTDOOR ACTIVITIES (14)** Subtotal \_\_\_\_ ÷ 14 = \_\_\_\_ Score for this category

- Looping walkways - Can residents choose from an abundance of walks of different lengths \_\_\_\_; with round-trip walks available \_\_\_\_; with interesting views \_\_\_\_?
- Safe paving - Is paving level, smooth, no deep cracks, and easy for wheelchairs \_\_\_\_; with a non-skid, non-glare surface \_\_\_\_?
- Comfortable safe walkways - Are walkways partly shaded from mid-day or hot afternoon sun \_\_\_\_; with handrails along at least a few parts of the walkways \_\_\_\_?
- Walkway seating - Can residents find seating along walkways at frequent intervals (~50') \_\_\_\_; with some shaded seating \_\_\_\_?
- Attractions/ destinations - In this outdoor area, can residents see interesting features to enjoy or walk toward \_\_\_\_? (such as a sundial, bird house, arbor, pergola, gazebo, fountain, fish pond, flower bed, etc.)
- Social interaction/ children - Are there places that support social activities \_\_\_\_; (such as picnic tables, gathering spots, etc.) and play areas or other amenities for children, where residents can watch and/or interact with them \_\_\_\_?
- Recreation/ exercise/ gardening - Does this area have amenities for residents to watch or engage in specific outdoor activities \_\_\_\_; (such as croquet, horseshoes, golf putting practice, swimming, an exercise station, etc.); are there places that encourage residents and staff to engage in gardening \_\_\_\_?

**4. INDOOR-OUTDOOR CONNECTION (11)** Subtotal \_\_\_\_ ÷ 11 = \_\_\_\_ Score for this category

- Visibility - Can this outdoor space be easily viewed from well-used indoor areas \_\_\_\_; and is it easy to reach \_\_\_\_?
- Alternate entrances - Are there multiple ways residents can reach this outdoor area from inside the building \_\_\_\_?
- Transition zones - Are there comfortable places to linger next to the doorway, indoors \_\_\_\_; and outdoors \_\_\_\_?
- Doors - Are doors unlocked during daytime \_\_\_\_; can residents easily open the door with little effort \_\_\_\_; and the door does not close too quickly \_\_\_\_; is there an automatic door available, that is easy to use \_\_\_\_?
- Thresholds - Can residents in walkers or wheelchairs easily cross the door threshold without difficulty \_\_\_\_; and is there a wide paved landing outside the doorway \_\_\_\_?

**5. CONNECTION TO THE WORLD (6)** Subtotal \_\_\_\_ ÷ 6 = \_\_\_\_ Score for this category

- Front porch - Is this space an "Entry Garden" or front porch, located at (or next to) a main entry of the building \_\_\_\_?
- Watch visitors, deliveries - From this area, could residents watch vehicles arriving at the facility \_\_\_\_; or watch front-door activities, with a chance to greet people \_\_\_\_?
- View landscape features - From this area, can residents see nearby landscape features such as trees, hills, etc. \_\_\_\_?
- See nearby surroundings - From this area, can residents watch nearby streets and traffic \_\_\_\_; or human activities, buildings, and neighborhoods \_\_\_\_? (such as stores, houses, apartments, a bus stop, people walking, bicycling, etc.)

**THANK YOU** for using this tool – please feel free to contact us at [rodiek@tamu.edu](mailto:rodiek@tamu.edu) with any questions.

You can add up the subtotal for each category, and divide by the number of items to obtain the score for that category; the total will give you an overall score. Using the same process, you can compare different outdoor areas.

Weighting is being developed to generate scores that reflect the relative importance of the 60 different items. This will be based on the relevant literature, residents' surveyed preferences, outcome-based findings, and surveyed expert opinions. Weighting will be available as a formula embedded in an Excel spreadsheet, allowing you to enter your raw scores, and convert them into weighted scores.

Please see the Access to Nature website at <http://www.accesstonature.org/resources.html> for more copies of this evaluation tool, and to access an Excel spreadsheet, when available, for weighting your results.

**APPENDIX C**  
**RESIDENT QUESTIONNAIRE**

**RESIDENT SURVEY**

**THANK YOU so much for helping with our survey!!**

Your opinions will help us design FUTURE senior communities,  
and will not change the place you live now.

**Your opinions will be kept CONFIDENTIAL.**

## RESIDENT SURVEY

Please make a CHECK MARK (✓)  
for your answer.  
There are no right or wrong answers.  
THANK YOU !!!

1. Are you a :

\_\_\_ Man

\_\_\_ Woman

2. What is your age (OR what year were you born?) \_\_\_\_\_

3. About how long have you lived in this senior community?

\_\_\_\_\_

4. What was your former occupation? (examples; house wife, engineer, nurse, etc.)

---

5. During the past month, how has your overall HEALTH been?

\_\_\_ Very poor

\_\_\_ Somewhat poor

\_\_\_ Somewhat good

\_\_\_ Very good

**6. Do you usually get assistance with:**

Bathing

Dressing

Eating meals

None of these

**7. Do you have vision problems that make it hard to get around?**

No

Yes

**8. Have you had any bad FALLS that kept you from getting around at least a few weeks afterward?**

No

Yes

**9. Which of the following do you use MOST OFTEN to get around?**

Need no assistance to get around

Power Scooter

Wheelchair

Walker with Seat

Walker

Cane

Other \_\_\_\_\_

**10. Did you spend much time OUTDOORS while you were growing up?**

A lot of time

Not much time

**11. Do you CARE much about spending time outdoors?**

Not at all

Somewhat

Very much

(why or why not?): \_\_\_\_\_

**12. AFTER spending time outdoors, how do you usually FEEL?**

Worse than before

Same as before

Better than before

**13. Please DESCRIBE how you feel after being outdoors:**

\_\_\_\_\_

\_\_\_\_\_

**14. How OFTEN do you typically USE the outdoor areas, HERE at this senior community, WHEN THE WEATHER IS NICE?**

- Never
- Seldom or almost never
- Every month
- Twice a month
- Every week
- Every day
- More than once a day

**15. If you use the outdoor areas HERE at this senior community, about HOW LONG do you usually STAY OUTDOORS, on average, WHEN THE WEATHER IS NICE?**

- 5 minutes or less
- About 15 minutes
- About 30 minutes
- About 45 minutes
- About one hour
- About 1-1/2 hours
- Two hours or more

**16. What do you usually DO in the OUTDOOR AREAS HERE at this senior community?**

Stay in one place

Move around

**17. What is your FAVORITE OUTDOOR PLACE for walking or spending time outdoors at this senior community?**

(Please describe): \_\_\_\_\_

**18. Which outdoor feature do you enjoy THE MOST?**

Birds and wildlife

Trees and greenery

Flowers

Ponds, fountains, other water features

Other ( please describe ): \_\_\_\_\_

**19. How much do you LIKE the OUTDOOR AREAS HERE AT THIS SENIOR COMMUNITY?**

Not at all

Somewhat

Very much

**20. How well are the OUTDOOR AREAS here designed to meet the needs of seniors?**

- Outdoors very well-designed for seniors
- Outdoors partly well-designed for seniors
- Outdoors not well-designed for seniors

**21. Are the outdoor WALKWAYS here well-designed for the needs of seniors?**

- Walkways very well-designed for seniors
- Walkways partly well-designed for seniors
- Walkways not very well-designed for seniors

**22. Would you like to add more PLANTS, TREES, and FLOWERS to the outdoor areas at this senior community?**

- Add a lot more
- Add a few more
- Just enough now
- Too many now

**23. How hard is it for seniors to SEE and REACH the OUTDOOR AREAS here at this senior community?**

- Very hard
- Somewhat hard
- Somewhat easy
- Very easy

(If hard, please say why): \_\_\_\_\_

**24. How physically COMFORTABLE is it for seniors, to spend time in the outdoor areas here?**

Very uncomfortable

Partly comfortable

Very comfortable

Why? \_\_\_\_\_

**25. Are there enough DIFFERENT places to SIT in the outdoor areas here at this senior community?**

No

Yes

**26. What do you like BEST or LEAST about being outdoors at this senior community?**

(please describe):

---

---

**27. If you could add ONE THING to the outdoor areas here, what would you add?**

(please describe:) \_\_\_\_\_

**28. Have you ever worried about FALLING while using the outdoor areas at this senior community?**

Often

Sometimes

Seldom or never

**29. Do you usually spend much time LOOKING OUTDOORS THROUGH WINDOWS:**

Always or frequently

Once in a while

Seldom or never

**30. Do you feel more FREE when you are AT:**

The INDOOR areas

The OUTDOOR areas

No difference

**31. Has it ever bothered you when people are SMOKING in outdoor areas?**

Always or frequently

Once in a while

Seldom or never

**32. Do you personally have a pet of your own living with you in this senior community?**

No pets

Dog

Cat

Other (Please describe) \_\_\_\_\_

**33. How much PHYSICAL ACTIVITY do YOU usually get, compared with other seniors living here?**

Less than average

Average

More than average

**34. Do you ever TAKE WALKS, INDOORS OR OUTDOORS, JUST to get your EXERCISE?**

Never

Seldom

Once a month

Twice a month

Once a week

Every day

More than once a day

**35. IF you WALK FOR EXERCISE, about how LONG do you usually walk each time?**

5 minutes or less

About 15 minutes

About 30 minutes

About 45 minutes

About one hour

About 1-1/2 hours

Two hours or more

**36. IF the weather is nice, would you PREFER to do your walking:**

Mostly indoors

half and half

Mostly outdoors

**APPENDIX D**  
**STAFF QUESTIONNAIRE**

**STAFF SURVEY**

**THANK YOU so much for helping with our survey!!**

Your opinions will help us design FUTURE senior communities,  
and will not change the place you live now.

**Your opinions will be kept CONFIDENTIAL.**

## STAFF SURVEY

Facility \_\_\_\_\_ Date \_\_\_\_\_

Position or Role \_\_\_\_\_

**Please make a CHECK MARK (√) for your answer.  
There are no right or wrong answers.  
THANK YOU FOR YOUR HELP !!!**

**1. Are you a :**

\_\_\_ Man

\_\_\_ Woman

**2. What is your age \_\_\_\_\_**

**3. About how long have you worked at this senior community?**

\_\_\_\_\_

**4. During the past month, how has your overall health been?**

\_\_\_ Very poor

\_\_\_ Poor

\_\_\_ Fair

\_\_\_ Good

\_\_\_ Excellent

**5. Did you spend much time outdoors while you were growing up?**

A lot of time

Not much time

**6. In nice weather, HOW OFTEN would you say the typical RESIDENT uses the OUTDOOR Areas AT THIS FACILITY, on average?**

Never`

Seldom or almost never

Every month

Twice a month

Every week

Every day

More than once a day

**7. In nice weather, about how long do RESIDENTS usually STAY**

**OUTDOORS, on average?**

5 minutes or less

About 15 minutes

About 30 minutes

About 45 minutes

About one hour

About 1-1/2 hours

Two hours or more

**8. In WHICH OUTDOOR AREA(S), here at this facility, do residents spend the most time?**

( please describe ):

---

**9. What are the main things residents usually do in the outdoor areas around here?**

\_\_\_ Walking

\_\_\_ Sitting

\_\_\_ Other ( please describe ):

---

**10. Do you ever worry about residents going outdoors?**

\_\_\_ Seldom or never

\_\_\_ Sometimes

\_\_\_ Often

**If so, what concerns you most?** \_\_\_\_\_

**11. Does the building design make it easy or hard to keep an eye on residents from indoors, while they are outdoors?**

\_\_\_ Very hard

\_\_\_ Somewhat hard

\_\_\_ Somewhat easy

\_\_\_ Very easy

**12. Are there any regularly scheduled outdoor activities for residents?**

No

Yes

**If “Yes”, what are they, and about how often?**

---

---

**13. Do you think it is good or bad for residents to go outdoors at this facility?**

mostly bad

somewhat bad

somewhat good

mostly good

**If bad, what concerns you most?**

---

---

**If good, how do you think it helps?**

---

---

**14. Is there an outdoor area where residents can grow plants themselves?**

No

Yes

**If “Yes”, is it used very much? \_\_\_\_\_**

**15. Is there any kind of horticultural therapy program for residents?**

No

Yes

**If “Yes”, please describe \_\_\_\_\_**

**>>>NOW, PLEASE TELL US HOW YOU USE OUTDOOR AREAS HERE AT THIS FACILITY.**

**16. In nice weather, how often do YOU typically go outdoors here at this facility?**

Never

Seldom or almost never

Every month

Twice a month

Every week

Every day

More than once a day

**17. IF you use the outdoor areas here at this facility, about how long do you usually STAY outdoors in nice weather?**

\_\_\_ 5 minutes or less

\_\_\_ About 15 minutes

\_\_\_ About 30 minutes

\_\_\_ About 45 minutes

\_\_\_ About one hour

\_\_\_ About 1-1/2 hours

\_\_\_ Two hours or more

**18. What is the main reason YOU GO OUTDOORS?**

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**19. What is the main reason you DO NOT go outdoors more?**

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**→ EVEN IF your answer to Question 16 was “NEVER”, please continue, and answer any of the following questions that you have an opinion on. Thank you.**

**20. At WHICH ONE of the OUTDOOR PLACES here at this senior community, do you usually spend the most time?**

( please describe ): \_\_\_\_\_  
\_\_\_\_\_

**21. If you do use the outdoor areas, what do you usually do there?**

Walking

Sitting

Other ( please describe ): \_\_\_\_\_

**22. Are you more likely to go outdoors to:**

get privacy

see other people

**23. Do you enjoy spending time in outdoor areas here at this facility?**

Not at all

Somewhat

Very much

**Why or why not?** \_\_\_\_\_

**24. If you walk outdoors, in what area do you usually do most of your walking?**

**( please describe):** \_\_\_\_\_

**25. How satisfied are you with the OUTDOOR AREAS here at this community?**

Very unsatisfied

Somewhat unsatisfied

Somewhat satisfied

Very satisfied

**26. How satisfied are you with the INDOOR PARTS OF THE BUILDINGS here?**

\_\_\_ Very unsatisfied

\_\_\_ Somewhat unsatisfied

\_\_\_ Somewhat satisfied

\_\_\_ Very satisfied

**27. Do you VALUE being able to spend time outdoors at this facility?**

\_\_\_ Not at all

\_\_\_ Somewhat

\_\_\_ Very much

**28. Does this facility have the kinds of outdoor areas you most enjoy using?**

\_\_\_ Not at all

\_\_\_ Somewhat

\_\_\_ Very much

**29. If you could add one element to the outdoor areas here, what would it be?**

( please describe ):

---

---

**30. After spending time outdoors, how do you usually feel?**

Worse than before

Same as before

Better than before

**IF Better or Worse, in what ways:**

\_\_\_\_\_

**31. Do you care about having usable outdoor areas available in your work environment?**

Not at all

Somewhat

Very much

**32. Overall, what do you like best and least about being in the outdoors here?**

**Best:** \_\_\_\_\_

**Least:** \_\_\_\_\_

**33. Has it ever bothered you when people are SMOKING in outdoor areas?**

Always or frequently

Once in a while

Seldom or never

**34. Would you like to add more PLANTS, TREES, and FLOWERS to the outdoor areas at this senior community?**

Could add a lot more

Could add a few more

Have just enough now

Have too many now

**If more needed, what type should they be? \_\_\_\_\_**

**35. Have you ever been at an educational session about the benefits of outdoor space for residents or staff?**

No

Yes

**If so, please describe: \_\_\_\_\_**

**APPENDIX E**  
**RESIDENT INTERVIEW**

**Questions for Resident Interview in Facility for the Elderly**

**General Questions:**

1. How old are you?
2. About how long have you lived in this senior community?
3. During the past month, how has your overall health been?

**Specific Questions**

4. Could you tell me about the outdoor spaces at this senior community?
5. How long and how often do you use outdoor spaces when the weather is nice?
6. How do you feel about going outdoors?
7. What is your favorite outdoor place for walking or spending time at this senior community? (Please describe the place)
8. What do you usually do in outdoor areas at this senior community?
9. What environmental features you found appealing to going outdoors? (such as greenery, flower, water, bird, comfortable seating, and open spaces for Tai Chi)
10. What environmental features you found barriers to going outdoors? (such as lack of enough comfortable seating, lack of shading, uneven paving, doors are hard to open, thresholds are not easy to cross )
11. Overall, what do you think of the outdoor spaces in this facility?
12. If you could add one thing to the outdoor areas here, what would you add?

**APPENDIX F**  
**STAFF INTERVIEW**

**Questions for Staff Interview in Facility for the Elderly**

**General Questions:**

1. How old are you?
2. About how long have you worked at this senior community?
3. What is your position or role?
4. During the past month, how has your overall health been?

**Specific Questions**

5. Could you tell me about the outdoor spaces at this senior community?
6. How long and how often do you say the typical resident uses the outdoor areas when the weather is nice?
7. In which outdoor areas, at this senior community, do residents spend the most time? (Please describe the place)
8. What do residents usually do in outdoor areas at this senior community?
9. How do you felt about residents to go outdoors at this facility?

**Questions about staffs' outdoor usages**

10. How long and how often do you use the outdoor areas when the weather is nice?

11. What is the main reason you go outdoors?
12. What is the main reason you do not go outdoors more?
13. At which one of the outdoor places here at this senior community, do you usually spend the most time? (Please describe the place)
14. What do you usually do if you use the outdoor areas? (like walking, sitting, and others)
15. Overall, what do you like best and least about being in the outdoors here?
16. If you could add one thing to the outdoor areas here, what would you add?

## APPENDIX G

### BEHAVIOR MAPPING DATA COLLECTION FORM

#### Behavior Mapping Data Collection Form

Date:

Time:

Temperature:

Wind

NO.	Zone	Activity	Gender	Role
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

#### Activity Code

- 1 Walking with no aid
- 2 Walking with aid
- 3 Pushing wheelchairs for companions
- 4 Sitting in wheel chairs
- 5 Sitting on seats
- 6 Standing
- 7 Talking
- 8 Group Exercises
- 9 Individual Exercises
- 10 Watching or play with wildlife
- 11 Others

#### Gender Code

- 1 Female
- 2 Male

#### Role Code

- 1 Residents
- 2 Staff
- 3 Visitor

# APPENDIX H

## IRB APPROVAL

DIVISION OF RESEARCH



**DATE:** 05/24/2016  
**MEMORANDUM**  
**TO:** Chang Huang  
TAMU - Texas A&M University - Not Specified  
**FROM:** Human Research Protection Program  
Institutional Review Board  
**SUBJECT:** Study Misc. Form

---

**Study Number:** IRB2016-0364D

**Title:** External Space Design for Better Outdoor Activity Engagement among Elderly in Chinese Assisted Living Facilities

**Date of Determination:**

**Review Type:** Process Administratively

**Approval Period:** 05/24/2016 to 05/15/2017

**Documents Reviewed and Approved:** Only IRB-stamped approved versions of study materials (e.g., consent forms, recruitment materials, and questionnaires) can be distributed to human participants. Please log into iRIS to download the stamped, approved version of all study materials. If you are unable to locate the stamped version in iRIS, please contact the iRIS Support Team at 979.845.4969 or the IRB Liaison assigned to your area.

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**Description of Submission:** Study Miscellaneous Form

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**Comments:**

- CITI training documents acknowledged.
- Research is to be conducted according to the study application approved by the IRB prior to implementation.
- Any future correspondence should include the IRB study number and the study title.

---

Investigators assume the following responsibilities:

1. **Continuing Review:** The study must be renewed by the expiration date in order to continue with the research. A Continuing Review application along with required documents must be submitted by the continuing review deadline. Failure to do so may result in processing delays, study expiration, and/or loss of funding.
2. **Completion Report:** Upon completion of the research study (including data collection and analysis), a Completion Report must be submitted to the IRB.
3. **Unanticipated Problems and Adverse Events:** Unanticipated problems and adverse events must be

750 Agronomy Road, Suite 2701  
1186 TAMU  
College Station, TX 77843-1186

Tel. 979.458.1467 Fax. 979.862.3176  
<http://rcb.tamu.edu>

- reported to the IRB immediately.
4. **Reports of Potential Non-compliance:** Potential non-compliance, including deviations from protocol and violations, must be reported to the IRB office immediately.
  5. **Amendments:** Changes to the protocol and/or study documents must be requested by submitting an Amendment to the IRB for review. The Amendment must be approved by the IRB before being implemented.
  6. **Consent Forms:** When using a consent form or information sheet, the IRB stamped approved version must be used. Please log into iRIS to download the stamped approved version of the consenting instruments. If you are unable to locate the stamped version in iRIS, please contact the iRIS Support Team at 979.845.4969 or the IRB liaison assigned to your area. Human participants are to receive a copy of the consent document, if appropriate.
  7. **Post Approval Monitoring:** Expedited and full board studies may be subject to post approval monitoring. During the life of the study, please review and document study progress using the PI self-assessment found on the RCB website as a method of preparation for the potential review. Investigators are responsible for maintaining complete and accurate study records and making them available for post approval monitoring. Investigators are encouraged to request a pre-initiation site visit with the Post Approval Monitor. These visits are designed to help ensure that all necessary documents are approved and in order prior to initiating the study and to help investigators maintain compliance.
  8. **Recruitment:** All approved recruitment materials will be stamped electronically by the HRPP staff and available for download from iRIS. These IRB-stamped approved documents from iRIS must be used for recruitment. For materials that are distributed to potential participants electronically and for which you can only feasibly use the approved text rather than the stamped document, the study's IRB Study Number, approval date, and expiration dates must be included in the following format: TAMU IRB#20XX-XXXX Approved: XX/XX/XXXX Expiration Date: XX/XX/XXXX.
  9. **FERPA and PPRA:** Investigators conducting research with students must have appropriate approvals from the FERPA administrator at the institution where the research will be conducted in accordance with the Family Education Rights and Privacy Act (FERPA). The Protection of Pupil Rights Amendment (PPRA) protects the rights of parents in students ensuring that written parental consent is required for participation in surveys, analysis, or evaluation that ask questions falling into categories of protected information.
  10. **Food:** Any use of food in the conduct of human research must follow Texas A&M University Standard Administrative Procedure 24.01.01.M4.02.
  11. **Payments:** Any use of payments to human research participants must follow Texas A&M University Standard Administrative Procedure 21.01.99.M0.03.
  12. **Records Retention:** Federal Regulations require records be retained for at least 3 years. Records of a study that collects protected health information are required to be retained for at least 6 years. Some sponsors require extended records retention. Texas A&M University rule 15.99.03.M1.03 Responsible Stewardship of Research Data requires that research records be retained on Texas A&M property.

This electronic document provides notification of the review results by the Institutional Review Board.

**APPROVAL  
CONTINUING REVIEW OF RESEARCH  
Using Expedited Procedures**

February 15, 2018

Type of Review:	IRB Continuing Review Form
Title:	External Space Design for Better Outdoor Activity Engagement among Elderly in Chinese Assisted Living Facilities.
Investigator:	Chang Huang
IRB ID:	IRB2016-0364D
Reference Number:	070866
Funding:	None
Documents Approved:	IRB Continuing Review 2.0
Special Determinations:	Data Analysis Only
Risk Level of Study:	Expedited

Dear Chang Huang:

The IRB approved the continuing review of this research on 02/15/2018.

It is recommended that you submit your next continuing review by 01/14/2019 to avoid a lapse in approval. Your study approval will end on 02/14/2019.

Your study must maintain an **approved status** as long as you are interacting or intervening with living individuals or their identifiable private information or identifiable specimens.

*Obtaining* identifiable private information or identifiable specimens includes, but is not limited to:

1. using, studying, or analyzing for research purposes identifiable private information or identifiable specimens that have been provided to investigators from any source; and
2. using, studying, or analyzing for research purposes identifiable private information or identifiable specimens that were already in the possession of the investigator.



In general, OHRP considers private information or specimens to be individually identifiable as defined at 45 CFR 46.102(f) when they can be linked to specific individuals by the investigator(s) either directly or indirectly through coding systems.

If you have any questions, please contact the IRB Administrative Office at 1-979-458-4067, toll free at 1-855-795-8636.

Sincerely,  
IRB Administration

**APPROVAL  
CONTINUING REVIEW OF RESEARCH  
Using Expedited Procedures**

March 28, 2017

Type of Review:	IRB Continuing Review Form
Title:	External Space Design for Better Outdoor Activity Engagement among Elderly in Chinese Assisted Living Facilities.
Investigator:	Chang Huang
IRB ID:	IRB2016-0364D
Reference Number:	051729
Funding:	N/A
Documents Approved:	IRB Continuing Review Form
Special Determinations:	N/A
Risk Level of Study:	Expedited

Dear Chang Huang:

The IRB approved the continuing review of this research on 03/28/2017.

It is recommended that you submit your next continuing review by 02/15/2018 to avoid a lapse in approval. Your study approval will end on 03/15/2018.

Your study must maintain an **approved status** as long as you are interacting or intervening with living individuals or their identifiable private information or identifiable specimens.

*Obtaining* identifiable private information or identifiable specimens includes, but is not limited to:

1. using, studying, or analyzing for research purposes identifiable private information or identifiable specimens that have been provided to investigators from any source; and
2. using, studying, or analyzing for research purposes identifiable private information or identifiable specimens that were already in the possession of the investigator.



In general, OHRP considers private information or specimens to be individually identifiable as defined at 45 CFR 46.102(f) when they can be linked to specific individuals by the investigator(s) either directly or indirectly through coding systems.

If you have any questions, please contact the IRB Administrative Office at 1-979-458-4067, toll free at 1-855-795-8636.

Sincerely,  
IRB Administration