

A Review of Research on Elderly-Friendly Assessment

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Abstract: Research on elderly-friendly environments in China started relatively late. Initially, it focused on urban environments, and later gradually paid attention to the psychological and physiological needs of the elderly, becoming increasingly refined. Overall, the evaluation of urban elderly-friendliness focuses on public service facilities in urban residential areas, the elderly-friendliness of community public Spaces, urban leisure green Spaces, the elderly-friendliness of residential buildings, the evaluation of elderly-friendly cities, and public space facilities in old residential areas. By analyzing the influencing factors of elderly-friendliness through structural equations, a comprehensive and systematic elderly-friendly design evaluation system and design strategies can be constructed, attempting to create a green, harmonious, comfortable and convenient modern rural living environment for the elderly. Through the interpretation and analysis of the related concepts of rural landscape, elderly-friendly design, and emotional design, determined the convergence point of emotional design theory and the practice of elderly-friendly rural landscape design, and analyzed the specific application of Conrad Norman's three-level design theory.

1. Elderly-friendly

Domestic scholars started their research on elderly-friendliness relatively late. "Elderly-friendly" is often used in concepts such as "elderly-friendly design" and "elderly-friendly renovation", usually interpreted as making corresponding renovations or designs based on the needs and characteristics of the elderly. Some scholars also believe that the "adaptability" and "sharing" within elderly-friendly should be emphasized. The following table summarizes various definitions of elderly-friendliness.

There is no standardized and unified definition of the term "elderly-friendly" in the academic circle of China. Based on the existing norms and literature, domestic research on elderly-friendly properties mostly focuses on residential layouts, medical service facilities, and community planning, with the main focus being on meeting the daily physiological needs of the elderly. Another part of the research focuses on the classification of elderly residents, emphasizing the provision of elderly-friendly design ideas for the Spaces used by the elderly from a more professional perspective, and has put forward specific design requirements and norms [2].

Liu Haiqiang[20]	Elderly-friendliness refers to the ability of community planning and construction to meet the needs of the elderly at different times while satisfying the various demands of ordinary residents. As the physical condition of the elderly gradually declines, their perception and adaptability gradually weaken, and their demands for a sense of security and belonging gradually increase. Elderly-friendliness refers to the fact that the planning and construction of a community should meet the needs of the elderly at all stages without excluding ordinary residents.
Meng Gen[20]	"Elderly-friendly" is defined in all aspects closely related to the daily public activities of the elderly. It is mainly designed for the elderly group, meeting both the needs of the elderly and the regional characteristics of Xi 'an, while also taking into account other groups.
Liu Jianjun[20]	The so-called "elderly-friendly" means taking into account the behavioral activity characteristics and psychological needs of the elderly, pre-designing the space, and ensuring that the space is suitable for the elderly to use. Elderly-friendliness encompasses psychological identification, behavioral convenience and physical comfort. Meet the needs of people who have entered or are about to enter old age for their daily life, travel and rest, and demonstrate respect and humanistic care for the elderly.
Gesler, W.[20]	As people age, the physical functions of the elderly gradually decline. Negative psychological emotions have emerged, and the requirements for activity venues are gradually higher than those of young people. Therefore, in light of the special circumstances of the elderly, we should start from all aspects of the elderly and create a place that is more suitable for the activities of this special group of the elderly. This design process is called "elderly-friendly design".

Gesler, W.[20]	Elderly-friendly means having the function to meet the needs of the elderly, "adapting to the life care of the elderly", including physiological functions, comfort, safety, health, as well as psychological satisfaction and care, etc. That is, to develop from emphasizing elderly care to meeting the diversity, differences and compatibility characteristics of their group, and to pay more attention to the "adaptability" and "sharing" of "elderly-friendly".
Williams, A[20]	The so-called "elderly-friendly" refers to taking into account the behavioral activities of the elderly Based on the dynamic characteristics, physiological and psychological needs, ensure that the products, Spaces, etc. are suitable for the elderly to use, so that the elderly can also normally integrate into the daily life of the general public. Elderly-friendliness encompasses physical comfort, psychological recognition and behavioral convenience.

This article defines elderly-friendliness as meeting the physical, psychological and social needs of the elderly in the community and its environment, facilities and services, ensuring that the elderly can live safely, comfortably and conveniently while integrating into society. The capabilities and characteristics.

2. Overview of Research Progress on Elderly-friendly Evaluation

2.1. Research Status of Elderly-friendly Evaluation in Foreign Cities

Research on elderly-friendly assessment has achieved rich results in developed countries such as the United States and Japan. These studies mainly focus on areas such as urban communities, public facilities, nursing homes, and transportation. However, a comprehensive and systematic evaluation system for elderly-friendly landscapes has yet to be formed. Among them, service assessment is the starting point of the elderly-friendly evaluation research in Japan. In 1993, the Elderly Health and Welfare Bureau of Japan's Ministry of Health, Labour and Welfare formulated 100 evaluation items for nursing home services as a milestone event [20]. In 2001, the Japan Sustainable Building Association began to study the Comprehensive Environmental Performance Evaluation System for Buildings in Japan (CASBEE), further promoting the development of elderly-friendly evaluation. American scholars, on the other hand, pay more attention to the comfort and functionality of the elderly care environment, taking it as the core orientation of elderly-friendly evaluation. For instance, in 2001, American scholar Boswell D proposed that elderly-friendly cities should meet the special needs of the elderly [24]. Based on this, he established a city elderly-friendly evaluation system consisting of 100 indicators. In 2005, after the World Health Organization proposed the concept of "elderly-friendly cities", the American Association of Retired Persons (AARP) put forward eight assessment criteria in the "Guidelines for Evaluating Elderly-Friendly Communities" for the assessment of elderly-friendly communities. Professor Victor Regnier from the University of Southern California has proposed 100 design evaluation indicators from aspects such as outdoor landscape design and residential design, dedicated to creating a better living environment for the elderly. In 2010, AARP conducted a survey of livable communities in Tennessee and developed

evaluation indicators including convenient road traffic, friendly neighborhood relations and good airquality. In addition, the United States has accumulated rich experience in post-use evaluation of built environments, and the book "Post-use Evaluation of Residential Buildings" holds significant reference value in this field.

2.2. Current Research Status of Rural Elderly-friendly Evaluation Abroad

As the first country in Asia to face an aging population, Japan has conducted particularly thorough research on the issue of rural aging. In 1971, then Mayor of Kobe City, Japan, Tatsuo Miyazaki, proposed the concept of "Happy Village", aiming to ensure the social life and leisure activities of the elderly and the disabled. After 38 years of construction, "Happy Village" has become a model of humanistic care with its elaborately designed environment and facilities, providing diverse venues such as senior universities and rehabilitation centers [17]. The welfare demonstration new village "Yukarichu" in Japan provides gardening activity Spaces for the elderly in farmland areas, meeting their sense of participation and rehabilitation needs. Such rural elderly-friendly construction not only improves the quality of life for the elderly but also promotes local tourism and agricultural development, which is of reference significance for our country. After retirement, elderly people in the United States often choose to live in senior villages or retirement communities (CRCS). In 1960, Dell Weber Company built "Sun City", the largest retirement community in the United States, with the core aim of meeting the social needs of the elderly [18]. In 2008, Canada introduced the concept of "age-friendly villages" in the "Guidelines for Age-Friendly Villages and Remote Communities" and established a corresponding evaluation index system. Although there are abundant research achievements on elderly-friendliness abroad, China still needs to combine its own national conditions in the research on elderly-friendliness in rural areas and avoid mechanically replicating foreign models.

2.3. Research on the Elderly-friendly Evaluation of Domestic Cities

Domestic scholars' research in the field of elderly-friendly assessment has formed a relatively complete theoretical system and practical methods, covering multiple levels from micro to macro [25]. Most domestic research on elderly-friendly evaluation focuses on urban environments, especially big cities [26]. There are relatively few studies on rural areas, particularly rural travel-oriented elderly care communities, which leads to an incomplete match between the evaluation system and actual needs. In some studies, the evaluation indicators are overly focused on the physical environment, neglecting the diverse needs of the elderly such as psychological and cultural needs [27]. Existing research mainly focuses on urban elderly care communities or traditional rural elderly care models. However, as an emerging model, the elderly-friendly evaluation system of rural travel-oriented elderly care communities still needs further exploration [28].

Jiang Hongqing and Yin Xintong, taking Yuexiu District of Guangzhou City as an example, based on the usage demands and characteristics of facilities for the elderly, constructed an evaluation system for the elderly-friendly layout of public service facilities in existing urban residential areas from the dimensions of efficiency and fairness [29]. They also evaluated the elderly-friendly level of facility layout in Yuexiu District in combination with community living circles and proposed optimization[1]strategies. Yu Weiyi and Hu Hong, starting from the perspective of the "four characteristics" demands of the elderly for urban recreational green Spaces, adopted methods such as expert discrimination and analytic hierarchy process to study and construct an evaluation index system and calculation model for the elsenior-friendliness of urban recreational green Spaces. They proposed and practiced a method to efficiently obtain quantitative

index data using the nearest facility analysis module of [4]ArcGIS. Zhao Dongxia et al. conducted a questionnaire survey among the elderly in Dalian City, analyzed the construction standards of elderly-friendly cities in terms of ecological environment, material living environment, health environment, spiritual and cultural environment, and safety environment, and established several evaluation indicators under five major functional [3] layers. An Haoyuan defined the elderly-friendly nature of residential buildings as functional facilities that meet the physiological and psychological needs of the elderly, featuring safety, convenience and distinguishability. Through on-site investigation, he constructed an evaluation index system for the elderly-friendly nature of urban community residential buildings, which includes 1 target layer, 3 criterion layers, 7 sub-criterion layers and 34 indicator [5] layers. Dong Zhaowei took outdoor leisure and sports Spaces in cold regions as the research object. Through field investigation, he analyzed the behavioral characteristics of the elderly and constructed an elderly-friendly evaluation system, which includes one target layer, three criterion layers and eight indicator layers. He also established an evaluation model by combining the Analytic Hierarchy Process and the Delphi [6] method. Dai Juncheng et al. constructed an evaluation index library for elderly-friendly cities through literature analysis, expert consultation and interview surveys, which includes 33 evaluation indicators. They screened the indicators through principal component analysis and correlation statistical analysis, and ultimately formed a well-structured evaluation [7] system. Hu Tinghao et al. proposed a construction approach for elderly-friendly cities, deconstructing it into one goal, two systems, 14 construction fields and 89 evaluation indicators, thus forming a clearly hierarchical evaluation [8] system. In the research conducted by Luo Yu and other scholars in 2018, they ultimately determined an evaluation index system for elderly-friendly services in the elderly care departments of community health service centers, which includes 6 first-level indicators, 17 second-level indicators, and 55 such indicators, through the Delphi method and the Analytic Hierarchy process. This provides certain reference and guidance for the formulation of evaluation standards for integrated medical and elderly care [15] services. In 2023, Zhu Wenlong, Huang Weihao, and others constructed an elderly-friendly evaluation index system for public space facilities in old residential areas using the Analytic Hierarchy Process (AHP), which includes four criterion layers: facility function, safety, appearance style, and compensatory design. They also conducted case [8] studies. In the research conducted by Xie Bo and other scholars in 2015, they constructed assessment indicators for the living environment of elderly residential areas from four dimensions: location conditions, public facility environment, road traffic environment and public space [8] environment. Yong LAN, Wang Zhenzhen, Zhang Dongmin and others constructed a conceptual model and evaluation index system for the accessibility of home-based elderly care community services in their research in 2017. The index system includes five dimensions: availability, accessibility, affordability, acceptability and adaptability. An empirical study was conducted, and the research results showed that At present, there is still much room for improvement in the satisfaction of the elderly with the accessibility of community [18] services. In their 2021 research, Peng Zhongyi and Wang Yan constructed an evaluation index system from five dimensions: the interweaving of pedestrians and vehicles, motor vehicle parking issues, traffic fairness, the impact of vehicles on the environment, and traffic lighting and shading conditions, to conduct an empirical study on the traffic environment level of old residential [19] areas.

2.4. Research on the Elderly-friendly Evaluation of Rural Areas in China

Through research on the current situation of public Spaces in some rural areas of Xuzhou and interviews and questionnaire surveys with some elderly people, Zhao Tong summarized the issue of the elderly-friendly nature of public Spaces in rural areas. Furthermore, the design strategies for

renovation and upgrading are proposed. Combined with relevant examples, the strategies are demonstrated and explained. The practical significance and implementability of the elderly-friendly renovation and upgrading design of public Spaces in rural areas are pointed out. Public Spaces with humanized colors are created for the elderly in rural areas to adapt to and meet their elderly care needs [30]. MaFengqin's research on the elderly-friendly nature of rural public Spaces, by drawing on domestic and international elderly-friendly design methods for public Spaces, starts from both the material environment and the behavioral activities of the elderly for each type of public space, summarizes the elderly-friendly problems and deficiencies of each type of village public space, and then proposes key points for elderly-friendly renovation of each typical village public space. Finally, by comparing the commonalities and differences of the public Spaces in the three types of villages, a comparative summary is made to propose strategies for the elderly-friendly renovation of rural public Spaces in western[9]Beijing. Song Chenxu took the elderly-friendly outdoor public Spaces in rural areas of Handan as the research object and summarized the demands of rural elderly people for outdoor public Spaces. Based on this, the current situation of outdoor public Spaces in rural areas of Handan was systematically analyzed, and problems such as uneven distribution of squares, poor privacy of squares, poor road safety, monotonous green landscapes, and serious lack of barrier-free facilities were discovered. Summarize the influencing factors that may be closely related to elderly-friendliness, such as convenience, safety, facility conditions, aesthetic taste, social atmosphere and maintenance[8]management. In terms of the elderly-friendly nature of public facilities, Dong Lu explored the demand and current situation of facilities in the northern part of Zhejiang Province, identifying the main deficiencies in elderly-friendly facilities. Conduct questionnaire surveys and interviews among the elderly population to summarize the elderly-friendly needs. Design research is conducted on the contradiction between the current situation and demand of public facilities, and corresponding renovation countermeasures are proposed. Liu Haiqiang first sorted out the activity characteristics and spatial environment of rural elderly people, and summarized the current characteristics and problems of rural public facility construction. On this basis, the planning and design strategies for village public facilities based on the activity characteristics of the elderly are proposed from four aspects: spatial planning layout, activity function mixing, infrastructure design, and local culture implantation. Taking Zhangwu Village in Anji County as an example for in-depth discussion, the aim is to create a safe and comfortable elderly-friendly environment in rural residential areas, with the expectation of promoting the improvement of the elderly-friendly level in rural areas. Liu Jianjun introduced the concept of ecological livability and constructed evaluation models based on their respective characteristics. This paper analyzes the elderly care needs of the elderly of different ages in rural areas of southern Liaoning Province, explores the elderly-friendly design elements under the concepts of "ecology" and "livability", and attempts to construct the corresponding elderly-friendly evaluation model. By analyzing the influencing factors of elderly-friendliness through structural equations, a comprehensive and systematic elderly-friendly design evaluation system and design strategies can be constructed, attempting to create a green, harmonious, comfortable and convenient modern rural living environment for the elderly 错误!未找到引用源。 . Hu Haoyuan, through the interpretation and analysis of the related concepts of rural landscape, elderly-friendly design, and emotional design, determined the convergence point of emotional design theory and the practice of elderly-friendly rural landscape design, and analyzed the specific application of Conrad Norman's three-level design theory in rural landscape design. He provided suggestions and strategies suitable for rural landscape design from the three levels. Su Qi, through on-site research in Jinjiazhuang Village and distributing questionnaires to some elderly people, summarized the problems of elderly-friendly public Spaces in traditional villages. She then analyzed the specific problems of each village and proposed practical and feasible design strategies.

3. Research Review

Research on elderly-friendly environments in China started relatively late. Initially, it focused on urban environments, and later gradually paid attention to the psychological and physiological needs of the elderly, becoming increasingly refined. Overall, the evaluation of urban elderly-friendliness focuses on public service facilities in urban residential areas, the elderly-friendliness of community public Spaces, urban leisure green Spaces, the elderly-friendliness of residential buildings, the evaluation of elderly-friendly cities, and public space facilities in old residential areas. The main methods used include questionnaire surveys, on-site investigations, and the analytic Hierarchy process. The evaluation of the elderly-friendly nature of rural areas mainly focuses on two aspects: rural public Spaces and rural landscape design. The interview method and questionnaire survey method are mainly adopted. However, at present, there are relatively few studies on the elderly-friendly evaluation of rural travel-oriented elderly care communities, which need to be further strengthened.

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