

Research on Design of Community Elderly-Friendly Transformation Based on Knowledge Graph

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Abstract:

With the aging of population becoming increasingly prominent, the problem of community elderly-oriented transformation has gradually become a research hotspot in the field of environmental design. This article takes the literature on community elderly-oriented transformation collected by CNKI as the research object, uses Citespace software and CNKI visualization to sort out and analyze the relevant literature, summarizes the main aspects of the research on elderly-oriented transformation, and analyzes the current the research and development trend of community elderly care space redesign.

Keywords:

Community Environment, Elderly-Friendly, Transformation Design, Knowledge Graph

1. Research Background and Strategy

Since the reform and opening up, China's population structure has undergone tremendous changes that have attracted the attention of people from all walks of life. It was mentioned in the 20th Series of Reports on Economic and Social Development Achievements for the 70th Anniversary of the Founding of New China that China has met the United Nations standards for an aging society and is facing severe challenges

At present, the elderly occupy the majority of China's population, the improvement of elderly care facilities is undoubtedly a major project. Nowadays, there are some problems in the elderly care environment, such as less green space, limited space for activities, service facilities are not perfect enough to meet the physical and mental needs of the elderly. However, the establishment of large-scale elderly care facilities for the elderly requires a lot of resources and costs. The effective and rational use of old communities and existing houses to transform them into livable elderly care space can reduce the waste of resources.

In recent years, there has been an increasing number of researches on the community age-appropriate transformation, but the literature review in this research field is still less, and most of them are the summary and elaboration of the literature in

the master's and doctoral dissertations. Therefore, this paper makes a knowledge map based on the relevant literature of China HowNet, and from the main research institutions, authors. This paper makes a visual analysis on the distribution of research hotspots, topics and the influence of literature, to define the main research direction and development trend of community elderly-friendly transformation, aiming to make an intuitive analysis on the research status of community elderly-friendly transformation, so as to provide a visual reference for subsequent research scholars.

The Chinese database selected in this paper is CNKI, and the search keywords are set as “community age-appropriate transformation, community elderly-friendly transformation, community elderly services transformation”, the search time is March 15, 2021, a total of 390 articles are obtained and visually analyzed.

2. Analysis of Bibliometric and Visual Retrieval Result

2.1. The Overall Trend of Theoretical Research

In China, The development of theoretical research in the field of community elderly-friendly transformation started relatively late, as shown in Figure 1. Initially, there was little research in this field, but the number of articles published gradually increased from 2011, especially from 2013 to 2014, which showed an upward trend. The reason is not only in the increasing proportion of the elderly population in China, but also in the high attention paid by the CPC Central Committee and the government to the aging of the population. The promulgations and implementation of the 12th Five-Year Plan for the Development of China's Aging Cause in 2011 and Several Opinions of The State Council on Accelerating the Development of the Elderly Service industry in 2013 have increased researchers' attention to the elderly care service industry. From 2014 to 2016, the number of relevant literature published was rising slowly. Until 2016, China issued the policy document of Healthy China 2030 Planning Outline, although the number of documents fluctuated slightly, it still has an overall upward trend. This shows that Chinese design researchers have begun to gradually realize the importance of community elderly-friendly planning, and the research on community age-appropriate transformation is becoming more and more perfect.

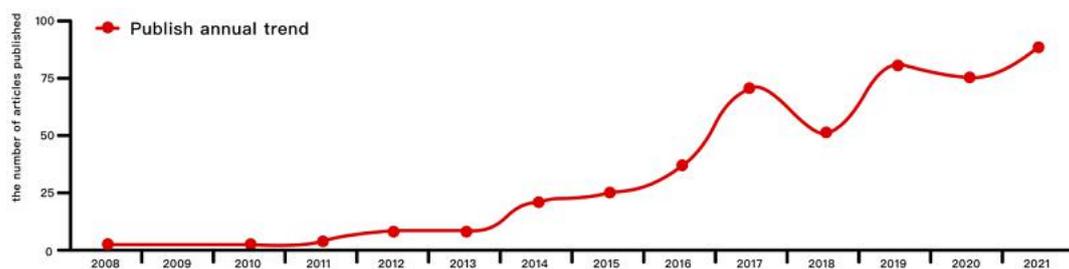


Figure 1. Annual analysis chart of the amount of articles published.

2.2. Main Research Institutions and Authors

From the perspective of major research institutions (Figure 2), Southwest Jiaotong University and Tianjin University rank first with 12 publications, followed by Xi'an University of Architecture and Technology and Beijing University of Technology. The main research institutions are mostly comprehensive universities and engineering universities, and mostly in the fields of architecture, industry and design. Among them, China Academy of Urban Planning & Design is outstanding in the institutions of non

colleges and universities. They take the old community, existing community and outdoor environmental transformation as the research objects, which has valuable reference significance for future researchers.

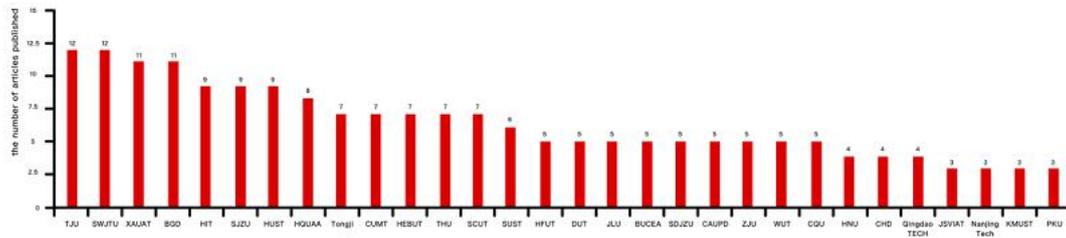


Figure 2. Statistical chart of the number of published literatures in community elderly-friendly transformation research institutions.

From the perspective of the main research authors (Figure 3), Professor Hu Huiqin of Beijing University of technology ranked first and published 7 articles in total. Professor Hu Huiqin’s recently published “Qualitative Thinking and Subject Analysis of Barrier-Free Environment Based on Aging Society” expounds the in-depth thinking on the design of space suitable for aging from three aspects: General barrier-free development, spatial intervention of built environment and construction of traffic environment [1]. Yao Dong from Tongji University, He Linghua from China Academy of Urban Planning & Design, Wang Rui, Liu Changgui, Yao Wang, Cao fan, Xing Ouya from Southwest Jiaotong University and Huang Jinhui of China University of mining and technology all published 3 articles, tied for second place. Among them, the author Liu Changgui takes the aging public facilities as the main research object, mainly studies the needs of the elderly and the ergonomics of the elderly, and displays his research results in front of people by means of design examples. He Linghua from China Academy of Urban Planning & Design, focuses on the problems existing in the outdoor environment of the old community as the main research object, and expounds the methods of aging suitability transformation of the old community from the aspects of greening environment and road site optimization. In addition, 57% of the researchers of community elderly-friendly transformation published 2 articles.

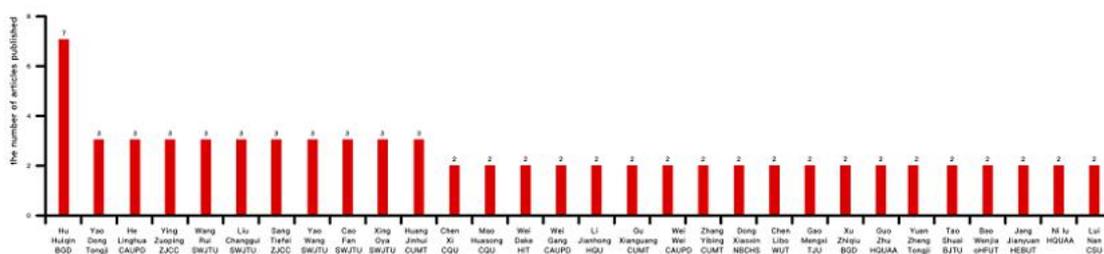


Figure 3. Statistical chart of the number of literatures published by community elderly-friendly transformation researchers.

2.3. The Influence of Literature

The influence of a literature is often related to its attention (cited and downloaded). Figure 1 lists the top ten cited research literatures on the community elderly-friendly transformation. “Problems and Strategies for the Aging Transformation of the Outdoor Environment of Existing Communities”, “The Elderly-Friendly Transformation of Old Houses” and “Research on the Optimization of Elderly Care Facilities in Existing Communities in the Central Area of Big Cities in China” ranked among the top three, which fully reflects the important impact of these literatures on

future researchers. “Problems and Strategies for the Aging Transformation of the Outdoor Environment of Existing Communities” ranked first with 77 citations and 2048 downloads. This paper analyzes the problems existing in the community elderly-friendly transformation in China, draws on the theories and examples of aging retrofitting in some developed countries, and puts forward some specific and feasible retrofitting and updating strategies [2]; “the Elderly-Friendly Transformation of Old Houses” ranked second with 73 citations and 2,106 downloads, the paper comprehensively analyzes the relevant theories and design practices of aging transformation at home and abroad, explores the shortcomings of the existing residential elderly care in the community from the actual needs of the elderly groups, and systematically expounds the methods of indoor and outdoor space aging transformation of old residential areas and the application of relevant technologies of aging transformation. Finally, the author discusses the difficulties in the development of community age-appropriate transformation and the ways to solve these problems [3]. “Research on the Optimization of Elderly Care Facilities in Existing Communities in the Central Area of Big Cities in China” refers to the mature theories of aging communities abroad, combined with field investigation, classifies the existing residences in the central area of major cities according to the construction time, studies the characteristics and existing problems of these elderly care communities, and puts forward the strategies for the optimization of elderly care facilities. [4]

2.4. Research Hotspots and Topic Distribution

Behind the higher frequency keywords appearing in the literature library is the research hotspot in this field. After using CiteSpace software to set keywords as node type parameters, the keyword co-occurrence network analysis diagram is drawn, showing that the research hotspots in this field include aging transformation, aging adaptation, elderly-friendly, home-based elderly care, aging, community elderly care, transformation, etc. According to the analysis and research of keyword network, the literature searched involves the fields of design, architecture, urban science, sociology, demography and so on. By extracting effective information from the titles, abstracts and keywords of relevant literature, it can be learned that the research focus of relevant literature on community aging transformation is five aspects: the living needs of elderly groups, the transformation design of community elderly-friendly public space, the transformation design of elderly-friendly indoor space, the transformation methods of community elderly-friendly and the evaluation system of community aging, which are described in detail below separately from these five aspects.

3. Literature Retrieval Review

3.1. The Living Needs of Elderly Groups

Researchers have analyzed and studied the housing needs of the elderly from different angles. From the perspective of the conditions of the elderly, Shen Chao et al. analyzed the factors affecting the demand for community elderly care services in terms of gender, age, different educational levels, different income and living style [5]. Starting from the physical and mental needs of the elderly, Wang Shaorui et al. analyzed the living needs of the elderly and the obstacles they may encounter when using ordinary houses from two aspects: physiological needs and psychological needs [6].

In order to explore the relationship between the demand for elderly care services

and living needs and health status, Li Xiuxia et al. Used the field interview sampling survey method to draw the conclusion that the elderly living alone and with poor health need community elderly care services more [7]; From the perspective of group diversity, Wu Yan et al. took the elderly in Chongqing as the research object, and analyzed the spatial needs of elderly people of different age groups for community elderly care in terms of living habits, elderly care services, and daily care by means of questionnaires and interviews [8].

3.2. The Transformation Design of Community Elderly-Friendly Public Space

For the design of the elderly-friendly transformation of community public space, this article elaborates from two aspects: the elements of the elderly-friendly public space and the transformation design strategy of the elderly-friendly public space .

3.2.1. the Elements of the Elderly-Friendly Public Space

In the book *Live Between Buildings*, Danish architect Jan Gail believes that "the outdoor activities of the elderly can be summarized into three aspects: social activities, spontaneous activities and necessary activities, and each activity type has different requirements for the outdoor environment [9], We should follow the rules and characteristics of the activities of the elderly in the process of community age-appropriate transformation; Starting from the livable model of home-based elderly care, Zhou Bo et al. proposed that the constituent elements of livable space for the elderly mainly include five aspects [10], small-scale multi-functional residential care system, dynamic communication system, pedestrian traffic streamline design, sign system design and leisure activity space design.

3.2.2. the Transformation Design Strategy of the Elderly-Friendly Public Space

In order to further study the aging adaptation of community public, the research scholars are most concerned about the the transformation design strategy of the elderly-friendly. From a macro perspective, Xie Bo et al. put forward the strategies of community age-appropriate transformation from four aspects: differentiated allocation of urban and rural elderly care service facilities, intensive allocation of community elderly care service facilities, focusing on optimizing public outdoor activity space for the elderly, and integrating community public space [11]. From the perspective of practical investigation, Chen Xiaohong explored the relationship between the elderly group and community public space through community field investigation, and put forward strategies such as increasing community aging suitable public space, introducing new community public space management mode, setting up children's game facilities near the elderly activity area [12]; Based on the activity characteristics of the elderly, Liang Weinan et al. have continuously explored the needs of the elderly for public space and facilities through in-depth analysis of the time and spatial distribution of leisure activities of the elderly group, providing design ideas for the aging transformation of community public space [13].

3.3. The Transformation Design of Elderly-Friendly Indoor Space

From the perspective of ergonomics, the *New Version of Concise and Accessible Building Design Data Integration* compiled by the Japanese architecture society provides strong data support for the design of traffic safety, sanitation facilities and living environment, etc., is described in combination with practical cases [14]. From the perspective of barrier-free design, Takahashi Yiping collected many forms of

barrier-free facilities, put forward many transformation methods of community elderly care facilities, and gave researchers some design ideas in the form of describing typical cases [15]; From the perspective of systematization, based on the existing achievements of aging design in developed countries and combined with field investigation and research, Li Sha summarizes that designers should systematically and professionally solve the problems existing in the aging transformation of residential units according to functions and needs [16]; From the perspective of space function, based on the physical and mental needs of the elderly, Xuan Wei expounds the universal principles of indoor space aging transformation, and puts forward the general points of indoor facilities aging transformation according to different space functions [17].

3.4. The Transformation Methods of Community Elderly-Friendly

From the perspective of focusing on health care, Xu Yishan et al. deeply discussed the structural mode and specific design strategy of aging space through studying typical cases, which provided reference significance for the future researchers to create an old-age livable environment [18]; Based on the model of “home-based endowment”, Zhou Dian et al. proposed that the construction and planning of aging housing should be carried out from two aspects: appropriately adding elderly housing in the urban building housing system and building “lifelong usable housing” [19]; From the perspective of housing sustainability, Hu Huiqin et al. put forward that aging housing construction is a systematic project. As designers, they should pay attention to continuing the elderly needs from self-reliance to the end of old age, establish aging housing construction and community pension service system, integrate community public resources, and make greater efforts to shape a multi-generational integrated community [20]; From the current situation of community age-appropriate transformation, Zhao Lizhi, based on the unsolved problems in the process of aging transformation of old communities in Beijing, expounds the strategies of community aging transformation from three aspects: transportation system in the community, community public service facilities, parking space and reasonable allocation of activity venues [21].

3.5. The Evaluation System of Community Aging

The increasing aging of the domestic population in China has made community aging a hot research topic. The 12th Five-Year National Science and Technology Support Plan project “Research and Demonstration of Community Aging Planning and Architectural Design Technology” proposes that the development and construction of national elderly care communities urgently need technical guidance, evaluation tools and facility allocation basis. Therefore, researchers try to build an evaluation system based on field investigation and statistical analysis. In the article “Primary Exploration on the Research of Community Age-Friendliness Evaluation Index System”, Jia Weiyang, through a large number of field investigations, counted the needs of the elderly in many communities in many cities with a high degree of aging for the elderly in the community, combined with the statistical analysis methods such as correlation and hierarchy, obtained the index weight coefficient of each level, and preliminarily constructed a relatively rational and reasonable evaluation index system [22]. From the perspective of post-use evaluation, Gao Hui, in his article “Research on Renovation for Elderly in City Existing Communities Based on Post-Occupancy Evaluation”, took the shortcomings of existing buildings as the starting

point, focused on the problems reflected by users and the relationship between buildings and environment, analyzed the effectiveness of existing community aging reconstruction projects, and established an evaluation index system. At the end of the article, some strategies for community aging transformation are put forward [23].

4. Conclusions and Expectation

To sum up, this article takes 390 literatures collected by CNKI in China HowNet from August 8, 2008 to March 15, 2021 as the research object, uses CiteSpace software and visual analysis of China HowNet to investigate and summarize the literature on community age-appropriate transformation, and discusses the literature output trend, distribution of research institutions, the main research authors and the literature with high attention also make a preliminary analysis on the research status of community aging transformation.

The number of literature on community age-appropriate transformation began to increase gradually in 2011, especially after 2014, although there are fluctuations, it is in an upward trend as a whole. The general trend of developing community age-appropriate transformation design and research is increasing with the aggravation of aging. With Southwest Jiaotong University, Tianjin University, Beijing University of Technology, Xi'an University of Architecture and Technology and Huazhong University of Science and Technology as the main research institutions, high-yield research scholars such as Hu Huiqin, Yao Dong, He Linghua and Wang Rui have emerged. There is a lack of cooperation between research institutions and research societies

By observing several literatures with high attention, it is not difficult to find that the community age-appropriate transformation mainly focuses on three aspects: the transformation strategy of old community aging-friendly transformation, the optimization of elderly care facilities and the evaluation index system of community aging-friendly transformation. The research hotspots mainly include the transformation of old community, aging-friendly transformation, transformation strategy, public space transformation and home-based elderly care.

Starting from the overall research trend of community age-appropriate transformation, the domestic research scope in this field is becoming wider and wider. From the beginning, the research on community aging transformation is carried out in combination with national policies and community old-age system, and gradually extended to the community age-appropriate transformation strategy of a specific city, and then to the community age-appropriate transformation evaluation index. Through the unremitting efforts of many research scholars, the research content of community age-appropriate transformation is more specific, the proposed strategies are more perfect, and the scope of the research is broader.

Through research and analysis, this paper holds that there are some problems in China's aging reform, such as insufficient research on the indoor living environment style of the elderly, insufficient research on the community elderly care facilities required by the elderly groups with different characteristics, and insufficient in-depth research on the psychological needs of the elderly groups with different age characteristics. It also puts forward two problems: barrier-free design of elderly-friendly living environment and basic methods of systematic community age-appropriate transformation. In the future design research, the author will continue to focus on these two problems and make in-depth research.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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