

The Research on Residential Interior Space Design Based on the Individual Needs for Elderlies

Feng Wang¹ and Isarachai Buranaut²

¹Shandong Youth University of Political Science, China

²Silpakorn University, Bangkok 10200, Thailand

Corresponding Author, E-mail: FENG_W@su.ac.th

Abstract

The form of aging in China is severe. In this context, the needs of the older people are becoming more and more prominent. Due to the limitations of the social development level and the influence of traditional concepts, the model of “aging in place” has been widely promoted in China. It is increasingly important to integrate the individual needs of the older people into the interior space design of home care. Age-friendly home care interior space design aims to create a safe, convenient, personalized and intelligent living environment to meet the diverse needs of the older people in their daily lives. This paper firstly proposes four major design principles, namely, the principle of complying with the co-existence of spatial safety and convenience, the principle of co-existence of continuity and flexibility, the principle of personalization in the selection of decorative elements, and the principle of intelligent spatial design, which provide a systematic framework for designers. These principles theoretically build the foundation of age-friendly space design and provide guidelines for actual design. And four major design strategies are proposed based on these four principles. Through these design principles and strategies, this paper provides scientific and reasonable guidance for the design of age-friendly home care interior space, aiming to create a safe, comfortable and personality-filled living environment for older people.

Keywords: Residential Interior Space Design; Individual Needs; Elderlies

Introduction

As a result of advances in medical technology, rising living standards and other factors. The problem of population ageing is gradually intensifying in most countries around the globe, i.e., the proportion of the population aged 60 and over in the total population is increasing(Cox, 1957). As shown in Figure 1, China's aging problem is also very serious. The development of China's current social security system is still relatively backward, and the pension system and health care system are not yet able to fully meet the needs of such a large number of older people in the short term.(Lin, 2018 : 96-105) At the same time, traditional Chinese culture has a strong family-centered perspective(Connidis & Barnett, 2018), and the older people generally tend to rely on family rather than government-provided services.

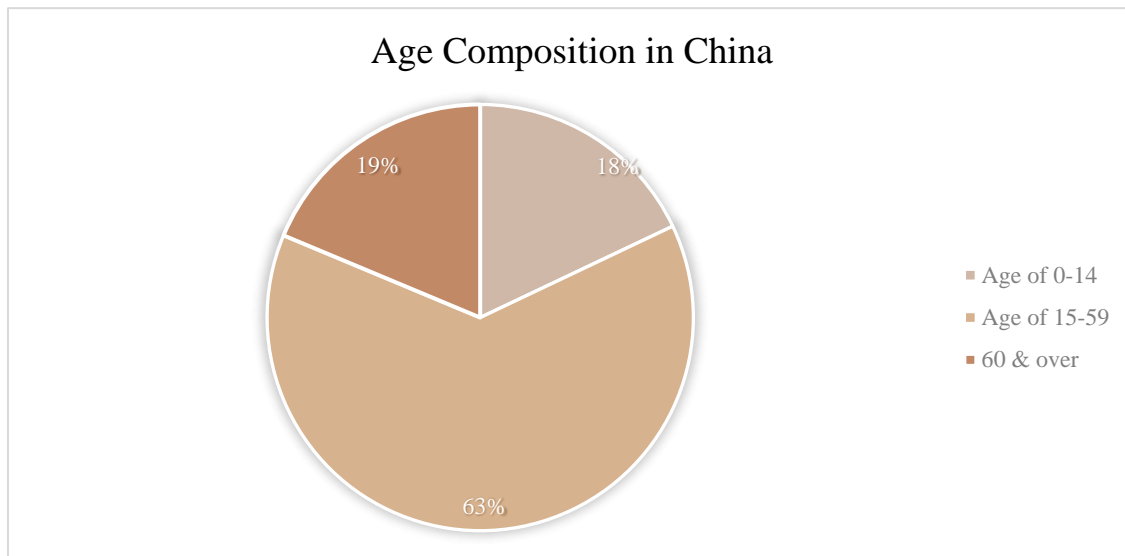


Figure 1 Age Composition in China
Source: Author's own work

Research in environmental psychology has shown that there is a positive correlation between family happiness and the quality of the living environment.(Zhou, Ji, & Jiao, 2021: 236-251) It has been found that even when older residents have diminished abilities, they can almost always successfully perform activities of daily living if they are familiar with their surroundings(Callahan Jr, 2019). In contrast, even older adults with less severe disabilities had difficulty with these activities if they were unfamiliar with their surroundings. These findings emphasize the positive supportive effects of "aging in place" on the external physical activity and internal mental health of older adults.

"Aging in place" is a relatively new term in gerontology that is becoming increasingly important as a concept with diverse meanings worldwide.(Rosenwohl-Mack, Schumacher, Fang, & Fukuoka, 2020) Although there is no consensus on the definition of aging in place, the U.S. Centers for Disease Control and Prevention describes it as "the ability to live safely, independently, and comfortably in one's own home and community,(Callahan Jr, 2019; Fougner, Bergland, Lund, & Debesay, 2019: 651-662) regardless of age, income, or ability level." Older adults generally tend to stay in their homes for as long as possible to maintain control of their lives. According to an American Association of Retired Persons survey, 76 percent of people age 50 and older choose to stay in their own homes for as long as possible, a choice that increases with age.(Forsyth & Molinsky, 2021: 181-196)

In China, the government has also begun to promote "aging in place" in recent years, introducing terms such as "conducive environment" and "home modification". Current research focuses on accessibility in the horizontal dimension of space based on ergonomic theory. Accessibility usually refers to the compliance of a dwelling with the regulations for accessible housing, the elimination of barriers and the development of an enabling environment through architectural and interior design modifications as well as the application of building technology. It can be seen that the current research mainly focuses on the perspective of indoor safety and the universal design to study the methods related to the design and remodeling of

accessible design in the living space. And relatively little attention has been paid to the personalized needs of the older people.

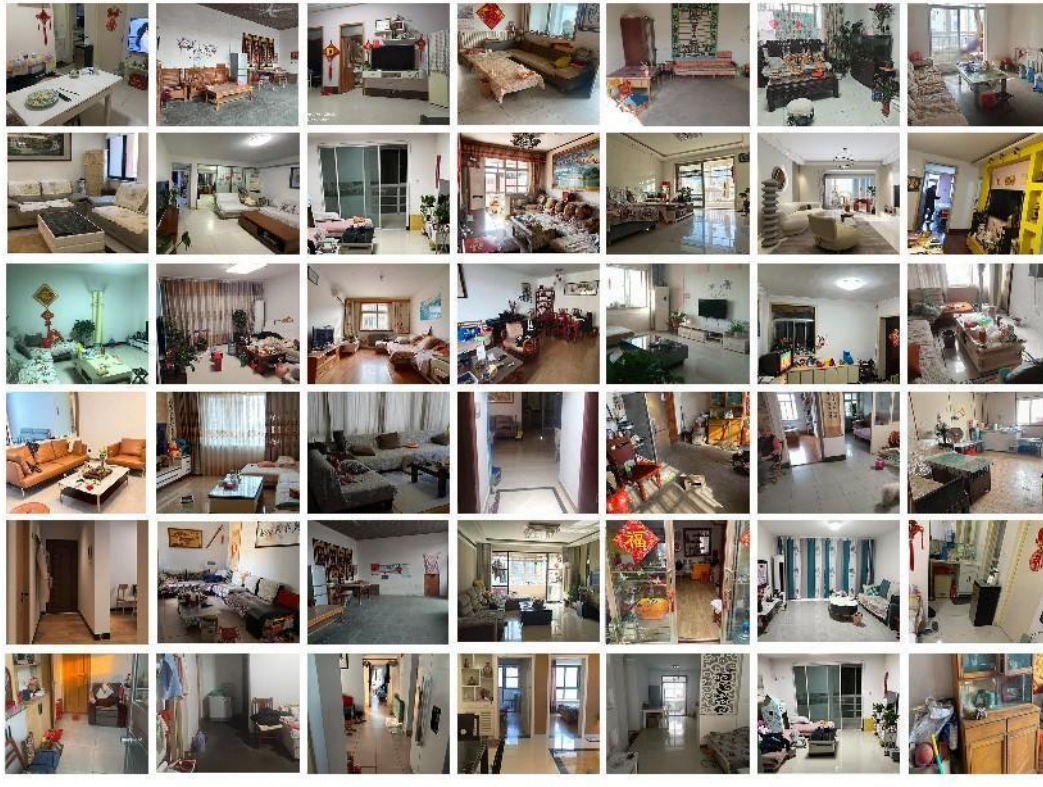


Figure 2 Lack of age-adapted design of interior spaces for “aging in place” in China
Source: Author's own work

Older people have different living habits, cultural level, occupation, etc., which requires the development of appropriate indoor space design programs for the older people. However, in the current situation, the indoor space design for the older people at home lacks attention to personalized needs, and is unable to meet the different physiological and psychological needs of different older people. Especially the attention to psychological needs is still relatively small.

The fulfillment of human needs is a process of continuous development from low to high, from material to spiritual, which is manifested in the demand for living space. It is an expansion from instrumental and material spatial needs to experiential sensory, psychological and even spiritual connotations. Nowadays, seniors' satisfaction with their homes goes beyond the consideration of functionality or practical use. Most design firms have come to view emotional needs as a primary factor in customer satisfaction. Therefore, studying the psychological preferences of older people for individual space design is an inevitable direction of development to enhance the comfort of age-friendly spaces. Age-friendly space design needs to work on non-material factors that stimulate the psychological experience of older people, such as aesthetic laws and aesthetic preferences. In other words, design emotionalization is gradually accepted. When users are in a specific environment, they will produce corresponding

experience feelings, and by comparing the result of this experience with the previous expectation, they can get the corresponding satisfaction evaluation, and "pleasantness" as an evaluation index can reflect the user's good feeling towards the environment. In addition to the traditional design requirements such as "useful" and "efficient", people are increasingly concerned about whether the design is "satisfying", "pleasing" and "emotionally satisfying". In addition to the traditional design requirements such as "useful" and "efficient", people are increasingly concerned with whether the design is "satisfying", "pleasing to the eye", "interesting", "intriguing" and "emotionally satisfying". In this paper, we will combine previous research to propose design principles for age-friendly interior spaces suitable for the individual needs of the older people, and propose space design strategies that incorporate the individual needs of the older people based on the corresponding design principles.

Basic Principles of Interior Space Design for Aging in Place

1. The principle of co-existence of safety and convenience in space design

Safety is the first thing to be considered when designing the indoor space for the older people at home.(Serrano-Jiménez, Blandón-González, & Barrios-Padura, 2022) With the gradual decline of human body functions with age, the older people psychological and physiological changes, resulting in a greater reliance on indoor space, the need for indoor space with a high degree of safety.

At the same time, the design process should fully consider the actual needs of the older people individual, the organization of the home space to make reasonable arrangements to improve the efficiency of communication between them and the outside world. Consider the different home behavior preferences of elderly users, and carry out targeted design.

2. The principle of continuity and flexibility in space design

With the increase in age, the ability of the older people to accept new things will gradually weaken, more dependent on the familiar environment, and more willing to live in a familiar environment. Therefore, when designers carry out interior space design, they need to consider the continuity of the older users' home living habits.(Demirkan, 2007: 33-38; Forsyth & Molinsky, 2021: 181-196; Li, Fan, & Leng, 2018: 1462-1468) Try to maintain the continuity of space.

However, due to the general phenomenon of physical decline of the older people, it is also necessary to consider some of the degenerative changes that may occur in the future of the body of the older people in the design process. Develop changeable and flexible indoor layout programs, for example, the use of movable furniture and equipment, adjusted at any time according to the individual's health status and lifestyle.

3. Individualized principle of selecting decorative elements

Decorative elements as the main component of space decoration. It is the space element that most easily reflects the personalized needs of the older people in the whole space design. The selection of decorative elements should fully consider the personality and preferences of the older people. For example, the choice of colors and patterns that meet the needs of the older people personality.

4. Intelligent principle of space design

Scientific and technological equipment support can provide targeted spatial support for different elderly people. Combined with intelligent technology, such as smart home systems, remote medical monitoring and intelligent security systems, to meet the needs of different elderly home behavior.

Design Strategies for Integrating the Individual Needs of the older people into the Interior Space Design for Aging in Place

1. Safe and convenient space design strategy

As age increases, human body functions gradually decline, the designer should first ensure the safety and convenience of the spatial environment. Ensure that the older people live in a safe and convenient space environment. Ensure that the indoor passage is smooth, remove unreasonable obstacles in the space.

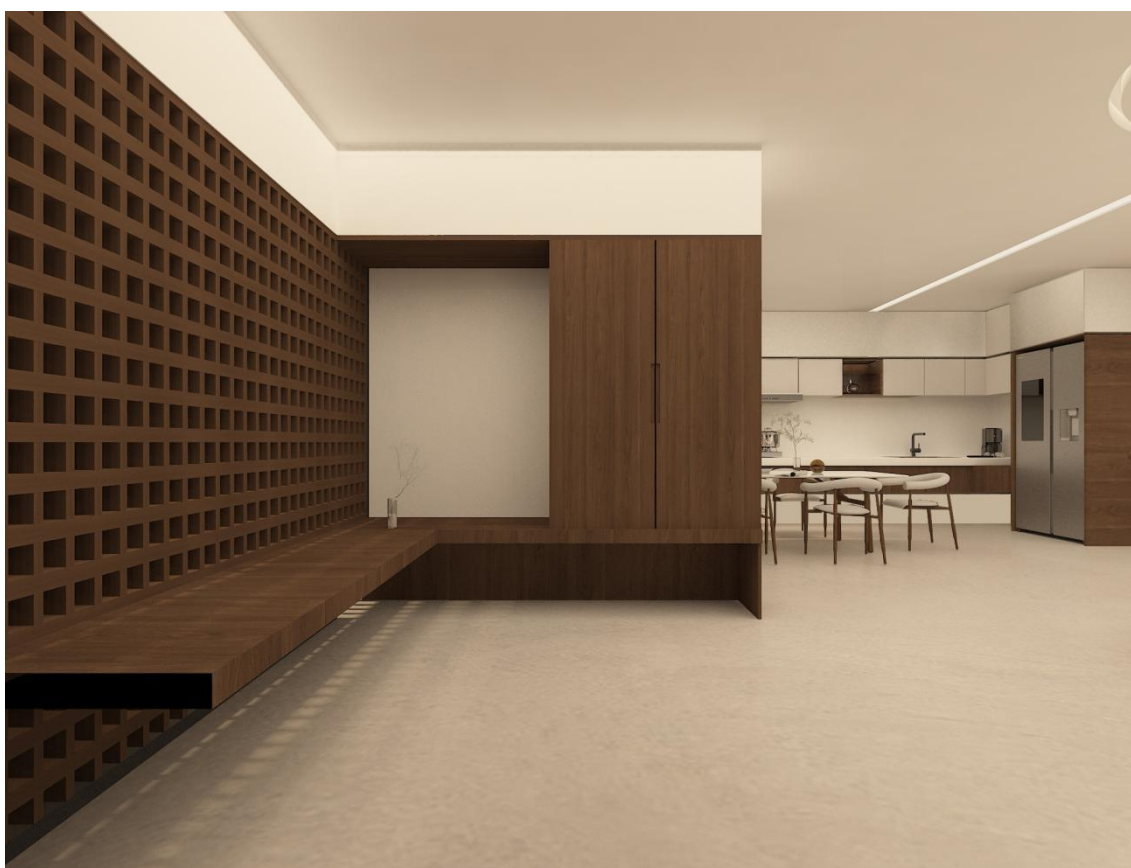


Figure 3 Square and open foyer design
Source: Author's own work

Take the foyer design as an example. For the age-friendly interior space design. As shown in Figure 3, the foyer depth design can be shorter, presenting a square open space design, so that the furniture in the foyer around the import and export placement of more space, convenient at the same time to better meet the habits of the older people use. And shorter foyer design in the enhancement of spatial openness at the same time, for the use of wheelchairs for the older people, pass and turn more convenient. If the older people elderly living room design when the foyer is long and narrow, the depth is large, it will make the whole space seems claustrophobic, and furniture placement is limited, in order to make enough space for activities,

furniture is generally to be along the wall layout and design, which will lead to the import and export space becomes narrow. And for those activities of the older people, its wheelchair, stretcher volume are relatively large, a narrow, long foyer for its access, very much in the way. In addition, in the older people living room design, the number of door openings in the foyer should be minimized, too many openings will not only have an impact on the placement of equipment and furniture, but also because of the route conflict so that access to the person and walking collision, in the older people is very unsafe. In addition, when the space structure can not be changed, you can try to adjust the left and right position of the door, the doorway as far as possible to centralize the entry and exit areas, so as to reserve a whole wall for the placement of furniture.

For the older people who can take care of their own lives, their activity area is no different from normal people, in the foyer to change shoes, change coats, open and close the door and lights and other fast and frequent, can be placed in the foyer location of the shoe cabinets, hooks, shoe stools and storage cabinets and so on. For the older people who need help with mobility, in addition to the above items, you should also install safety handrails to facilitate their movement. For the older people who are in the assisted stage, although they spend most of their time indoors and seldom go out, if they are sick, they will need the assistance of a stretcher or a wheelchair to make it easier for them to go out, so a spacious foyer is very necessary.

2. Personalized space planning strategy



Figure 4 The vertical dimension layout of the cloakroom
Source: Author's own work

(1) Reasonable arrangement of horizontal and vertical dimensions of space. Indoor space is a three-dimensional space, and the whole contains both horizontal and vertical dimensions.(Bridger, 2008; Das & Grady, 1983: 449-459; Hu et al., 2007: 303-311; Murrell, 2012; Tosi & Tosi, 2020) Within these two dimensions, the space should be reasonably arranged. The space layout planning that is more suitable for the physiological ability of the older people will greatly improve the satisfaction of the older people to the space.(Wang, Buranaut, Zhang, & Liu, 2023)The horizontal dimension of the spatial layout focuses on the study of accessibility and reachability of space. There have been many detailed discussions among scholars before. This paper focuses on the layout of the vertical dimension, which is mainly aimed at the significant decline in joint mobility of the older people that can impair their independent living.

Among all the spaces in the house, the spaces with a more complex and large number of inclusions are more critical to consider the vertical layout, and the layout of the vertical dimension of this type of space significantly affects the comfort of older people in using the space.As shown in the Figure 4, vertical dimension layout of the cloakroom. It is important to note that the vertical heights of inclusions with a specific height requirement should be set from the perspective of the zone to ensure that the whole or a large part of the operating zone is within a reasonable height range

(2) Setting up space to satisfy behavioral preferences: Considering the individual differences of the older people, understand their behavioral preferences, and set up space in the interior space of the house to create personalized space to satisfy their behavioral preferences.(Bridger, 2008; Garneau & Parkinson, 2016: 143-154; Murrell, 2012)

As shown in Figure 5, if the older people are keen on reading, a reading corner can be set up with bookshelves, soft chairs, and appropriate lighting to create a peaceful reading environment.



Figure 5 An exclusive reading space for the older person's individual reading needs
Source: Author's own work

3. Specialty furniture and décor selection strategies:

(1) Personalized furniture: Consider the individual physical and psychological needs of older persons when choosing furniture. For example, chairs that are comfortable and easy to get up from, as well as beds and sofas that are ergonomically correct, can be used. Personalized furniture design should take into account the possible health conditions of older people, such as providing adequate support and comfort.(Albers, 2013; Ostwald, 2022; Żurek, Rudy, Stanisławczyk, & Duma-Kocan, 2023) At the same time, as shown in Figure 6, the choice of surface materials and colors of furniture should also take into account the preferences of individual older adults.

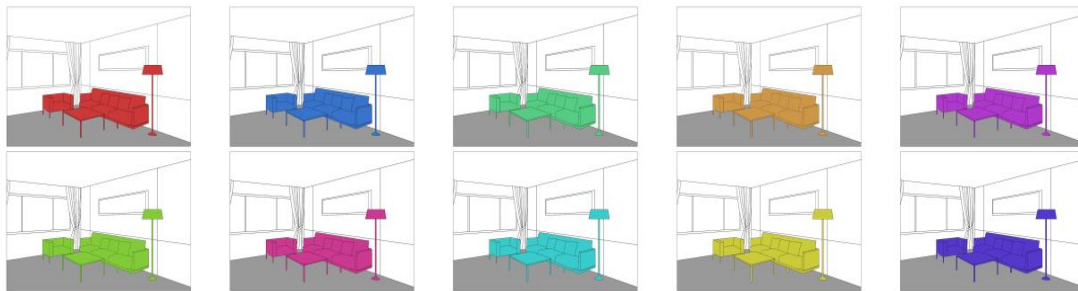


Figure 6 Furniture surfaces come in a very wide variety of colors

Source: Author's own work

(3) Functionality of furniture: Consider choosing furniture with multi-functionality to meet the different needs of the older persons in their daily lives. As shown in Figure 88, for the older people who have difficulty getting up, install auxiliary handrails on the side of the bed to facilitate the daily getting up behavior of the older people.



Figure 7 Furniture remodeling based on specific needs

Source: Author's own work

(3) Personalized Decorative Elements: Introduce personalized decorative elements. Consider colors, patterns, or special artwork that older adults prefer. This can help create a unique and welcoming living environment that meets the aesthetic and emotional needs of older adults. And you can set up a special area for displaying photos, family memorabilia and other personalized decorations can further express the personalized characteristics of the living space.



Figure 8 Older people who like to garden can choose flowers for their decorations
Source: Author's own work

4. Targeted support strategy of smart home

Based on the personalized needs of the older people home care indoor space design, scientific and technological equipment and intelligent system support can provide the older people with more targeted spatial support (Figure 9).



Figure 9 Aging Smart Home

Source: https://www.sohu.com/a/546274816_120928429

For example, some older people need telemedicine services, or services provided through smart home systems. For example, for individual seniors with serious behavioral deterioration, they can be provided with a home voice control system: a voice assistant can be configured to achieve voice control of smart home devices, including adjusting the temperature, opening curtains, playing music, etc. The system can be used to reduce their need for physical buttons and switches. Reduce their reliance on physical buttons and switches. Use smart home systems to provide targeted support for the various personalized needs of the older people.

Conclusion

Incorporating the concept of the needs of the older people into the interior space design of the older people at home requires designers to fully understand the needs of the older people and give scientific and reasonable design solutions based on this. The four principles of age-friendly home care interior space design are to comply with the co-existence of space safety and convenience, continuity and flexibility, personalization of decorative elements and intelligent space design. Corresponding design strategies are proposed. Under the principle of complying with the coexistence of spatial safety and convenience, we pay attention to the safety design strategy; the principle of coexistence of continuity and flexibility emphasizes the balance between stability and flexibility of the design, so that the space can be adapted to the diversity of the life of the older people; and the principle of the personalization of the choice of decorative elements focuses on the personalization of the color, pattern and decorative elements, so that the space is more in line with the personal interests of the older people and the aesthetic needs. Finally, under the principle of intelligent space design, we emphasize the integration of intelligent technology to provide a more targeted, convenient and intelligent living environment for the older people.

Overall, these principles and strategies provide more comprehensive and rational guidance for designers. Future research and practice should continue to focus on age-friendly home care interior space design to adapt to the trend of population aging and meet the individual needs of the older people.

References

- Albers, J. (2013). *Interaction of color*: Yale University Press.
- Bridger, R. (2008). *Introduction to ergonomics*: Crc Press.
- Callahan Jr, J. J. (2019). *Aging in place*: Routledge.
- Connidis, I. A., & Barnett, A. E. (2018). *Family ties and aging*: Sage publications.
- Cox, P. (1957). *Methods for Population Projection by Sex and Age*. In: Wiley Online Library.
- Das, B., & Grady, R. M. (1983). The normal working area in the horizontal plane A comparative analysis between Farley's and Squires' concepts. *Ergonomics*, 26 (5), 449-459.
- Demirkan, H. (2007). Housing for the aging population. *European review of aging and physical activity*, 4 (1), 33-38.
- Forsyth, A., & Molinsky, J. (2021). What is aging in place? Confusions and contradictions. *Housing Policy Debate*, 31 (2), 181-196.
- Fougner, M., Bergland, A., Lund, A., & Debesay, J. (2019). Aging and exercise: Perceptions of the active lived-body. *Physiotherapy theory and practice*, 35 (7), 651-662.
- Garneau, C. J., & Parkinson, M. B. (2016). A survey of anthropometry and physical accommodation in ergonomics curricula. *Ergonomics*, 59 (1), 143-154.
- Hu, H., Li, Z., Yan, J., Wang, X., Xiao, H., Duan, J., & Zheng, L. (2007). Anthropometric measurement of the Chinese elderly living in the Beijing area. *International Journal of Industrial Ergonomics*, 37 (4), 303-311.
- Li, X., Fan, L., & Leng, S. X. (2018). The aging tsunami and senior healthcare development in China. *Journal of the American Geriatrics Society*, 66 (8), 1462-1468.
- Lin, Y. (2018). An institutional and governance approach to understand large-scale social housing construction in China. *Habitat International*, 78, 96-105.
- Murrell, K. (2012). *Ergonomics: Man in his working environment*: Springer Science & Business Media.
- Ostwald, W. (2022). *The color primer: A basic treatise on the color system of Wilhelm Ostwald*: Walter de Gruyter GmbH & Co KG.
- Rosenwohl-Mack, A., Schumacher, K., Fang, M.-L., & Fukuoka, Y. (2020). A new conceptual model of experiences of aging in place in the United States: Results of a systematic review and meta-ethnography of qualitative studies. *International journal of nursing studies*, 10 (3), 103496.
- Serrano-Jiménez, A., Blandón-González, B., & Barrios-Padura, Á. (2022). Towards a built environment without physical barriers: An accessibility assessment procedure and action protocol for social housing occupied by the elderly. *Sustainable Cities and Society*, 76, 103456.
- Tosi, F., & Tosi, F. (2020). *Design for ergonomics*: Springer.
- Wang, F., Buranaut, I., Zhang, B., & Liu, J. (2023). Elderly-friendly indoor vertical dimensional layout method based on joint mobility. *Plos one*, 18 (5), e0285741.
- Zhou, F., Ji, Y., & Jiao, R. J. (2021). Emotional design. *Handbook of Human Factors and Ergonomics*, 236-251.
- Żurek, J., Rudy, M., Stanisławczyk, R., & Duma-Kocan, P. (2023). The Effect of Kosher Determinants of Beef on Its Color, Texture Profile and Sensory Evaluation. *International Journal of Environmental Research and Public Health*, 20 (2), 1378.