



A Conceptual Framework Development for Designing Nearby Nature for Older Adults

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Abstract. As the world population ages, the role of environmental design in promoting the health and well-being of older adults becomes increasingly important. This study aims to explore the concept of nearby nature and its potential benefits for the aging population, focusing on the specific needs and preferences of older adults. The study adopts a multi-disciplinary approach, involving researchers and practitioners from various fields including environmental psychology, urban planning, plant sciences, and landscape architecture. Through systematic steps of data compilation, categorization, and integration, the study identifies key themes related to designing for older adults as individuals and as a stage of life. These themes encompass aesthetics, thermal comfort, personal experiences, social cohesion, embracing changes and losses, sensory perceptions, and risks. The resulting design recommendations address both the physical requirements, such as accessibility and mobility, and the mental requirements, such as feelings, perceptions, and emotions, of older adults. The guidelines provide insights for creating inclusive and accessible nearby nature spaces that cater to the unique needs of older adults. This study emphasizes the importance of collaboration between researchers and practitioners in developing design solutions for the aging population. By bridging the gap between scholarly knowledge and practical expertise, the study contributes to the maturation of landscape architecture as a discipline. The findings and recommendations can serve as valuable tools for designers, planners, and decision makers in creating environments that promote the well-being and quality of life of older adults in urban areas.

Keywords: Nearby nature, older adults, well-being, design recommendations, conceptual framework

Introduction

The world population is aging (World Health Organization, 2015). Designers, planners, and decision makers can help slow and mitigate some limitations along with improve their health and well-being through environmental design. One of the environmental factors of human health and well-being is nearby nature, especially in the urban area (Suppakittpaisarn, Jiang, & Sullivan, 2017). To the overall population, nearby nature had several positive benefits towards human health [1-3]. Fewer studies are focused on the urban aging population. We need to explore whether older adults interact with nature differently, resulting in different relationships between nearby nature and their well-being. As we approach the aging society, I propose a series of call to actions so that designers, planners, and decision makers can design places that allow the older adult to thrive in their homes, towns, and any places they wish to be. Without addressing these requirements, these environmental designers may make the spaces that are unhelpful, unhealthy, or even harmful towards the aging population.

The World Health Organization had announced the year 2020-2030 as the Decade of Aging. By the end of 2030, the aging population would increase from 1 billion to 1.4 billion and are increasing faster in the developing countries [4]. People face new challenges as they age, such as reduced or limited

mobility and risks of injury and higher risks of memory loss and dementia. In the population scale, designers, planners, and decision makers may need to come up with the environmental design solutions for people with these changes [5].

There are many ways to define people within the aging population. When talking about aging, the World Health Organization (WHO), mostly refers to those above 60 years of age. However, they admitted that aging is not linear, and there are several factors that might affect how people age during the years [4; 6]. Someone who is 90 year-old might have the same capacity as another person who are only 65. Furthermore, there are many terms used to discuss the group. For example, 'older persons' are used by WHO [4]. At the same time, seniors [7; 8], elderly [9-12], and older adults [13-17] are also used across scientific communities. Among these definitions and descriptions, we chose the terms older adults because of its common use, however, we would say that there is no defined age for older adults. Rather, we examined this environmental design for those who have shown increasing symptoms that accompany aging, such as frailty, multimorbidity, losses in muscle masses, and decline in physical and mental capacities [6].

Growing body of evidence suggests how environmental designers might assist in creating of

healthy environments. Spending time in appropriate nearby environment can help improve human health and well-being [3; 18; 19]. Nearby nature is defined as places close to people's daily lives that have natural elements, such as street and neighborhood trees, parks, open spaces, and gardens. Theories and hypotheses are utilized to connect adjacent nature to human health and well-being. According to the Biophilia Hypothesis [20] and the Habitat Selection Theory [21], humans have intrinsic associations with the forms of nature from which they evolved: open grasslands and clusters of trees, and when exposed to such situations, humans receive psychophysiological responses [22; 23].

The stress reduction theory (SRT), also known as the psychoevolutionary Theory, supported the idea by claiming that people recovered from stress more efficiently in areas with mature trees, parks, and open spaces [24]. Evidence suggests that living near open spaces and trees may improve long-term health outcomes such as blood pressure, sleep patterns, and general hospital visits [18; 25-28]. This also impacts the economic outcomes. A research study in the United States found that for every 10 trees planted in a community, the residents' health spending is comparable to those with a \$10,000 USD higher income per year, and their health appeared to align with someone 7 years younger [29].

According to the attention restoration theory (ART), humans can exhaust their attention capacity, or ability to focus and process information, leaving them with a condition called mental fatigue [30]. People with mental fatigue become angry, illogical, impulsive, and less capable of making long-term decisions [31]. As a result, attention capacity may be a crucial component of human well-being. The notion proposed that being in nature, which grabs their fascination quietly while removing them from everyday problems, allowing their mind to wander, and inviting them to stay as long as they like, would replenish the person's attention capacity more successfully than other types of environments (Kaplan et al., 1998). Experimental and observational studies also suggested that such environment in nearby nature can influence positive behaviors and academic performance in students [32-34], but it can be beneficial to the older population as well [35].

Another environmental aspect for human health and well-being is interpersonal relationships: social cohesion. Social cohesion is a concept that describes how members of a community know one another and are willing to connect with one another [36,37]. Because loneliness and social isolation can be harmful to human health, particularly in older adults, social cohesion becomes an important aspect in human well-being, and the aging population must build strong social relationships with others [38,39].

Nearby nature can serve as a third location, a stage where people may relax and spend time together in a favorable environment.

According to the theories and supporting evidence, environmental designers can build urban spaces that improve human health and well-being through nearby nature. To encourage people to use such space, people must like it and feel emotionally attached to it. Preference for a location is a quick assessment of whether a person can thrive in an environment [40]. As a result, it becomes a component of human well-being in the built environment. The four features of a scene are identified as interacting aspects in constructing preferred landscapes: coherence, complexity, legibility, and mystery [41]. A more recent study classified urban components of preference into three landscape perceptions: naturalness, neatness, and safety [42]. These components may help environmental designers identify how people prefer the places, including the aging population.

While these theoretical bases had been investigated clearly among adult populations, researchers still need more evidence in the aging group. Many observational studies, both cross-sectional and longitudinal had been conducted to understand the relationships between the living environment and older adults' health. One study showed that privacy in the residential environment can help lower the risks of depressive symptoms in older adult [43]. Other study showed that the tree density and availability towards green and blue spaces around residence may positively impact the physical and mental health of the older adults such as stress, anxiety, depression, heart condition, adiposity, and bone density [44-49]. These health benefits can be strengthened with social interactions and physical activity levels.

In terms of the human scale of the environment for the aging population, many studies have focused on aging at home and mostly about how public green spaces may related to them [10; 44; 45; 50]. While there is evidence that greener environments are better for the aging population compared to little or no nature, the design of the environment is not highly emphasized. For the aging home facility cases, the older adults expressed that they value to nearby nature deeply but could not go due to their physical limitations [51]. In the aging-at-home groups, perception of safety and physical comfort became more important for the elders [50], especially because they are more vulnerable and less perceptive in some of the hazardous conditions, such as thermal discomfort [52]. At the same time, vigorous activity and mystery become less important, suggesting a shift in characteristics that may be important to the future designs [50].

Several knowledge gaps persist regarding the relationship between nearby nature and older adults' health. These gaps of knowledge prevented us from creating meaningful changes in physical environments across the world to accommodate healthy aging.

First, richer and more complex understanding of the relationship must be explored. What factors influence and mediate the relationship, and to what extent? In the literature, we found that social cohesion, perceived safety, and physical activity might be pathways through which nature influences health in aging populations [46,49,50]. Second, how do cultural differences and experiences within the culture shape the way the aging population interact with the environment and the magnitude of benefits they garner from the interaction—and to what extent? The cultures may inform their perceptions, preference, and decisions regarding nearby nature [53]. Third, there exist a gap between researchers and practitioners in the discipline [54; 55]. Previous research shows that in landscape architecture, the information from researchers may not be transferred easily to designers, and the questions from practitioners might not be addressed by researchers [56; 57]. Thus, this disconnection may prevent us from creating a mature design disciplines that are more inclusive and effective towards creating a better world [58; 59].

With these remaining challenges, the collaborations between environmental designers and researchers are needed. Environmental designers and decision makers have the opportunities to interact, change, and gather initial data and observations from the real world and inform researchers, while researchers can use those observations to conduct quantitative, qualitative, and mixed-method studies to inform designers and decision makers. These collaborative relationships must exist in the global scales to compare the results across geographical regions and cultures, and the conceptual framework might be needed to start this global collaboration. Thus, in this study, we asked the following question.

- What might be some landscape design recommendations address both the physical and mental requirements, such as of older adults?

Methods

In this study, we used a multi-disciplinary approach in conceptual framework development. This reflective analysis, serves as a method aimed at advancing scientific knowledge through the integration of various existing disciplines [60]. This research method is categorized as a secondary description research technique [54]. The example of previous works include the creation of a conceptual framework that merges geography and statistical geography to make landscape architecture decisions

[61], as well as the cultivation of a mixed-method approach for educational assessment [62], among other applications.

Six researchers and practitioners from the field of environmental psychology, urban planning, plant sciences, and landscape architecture were invited to contribute in the discussion. They were selected to represent the decision makers over nearby nature for older adults. A series of on-site, on-telephone, and online discussions were conducted from April- May of 2022. During these discussions, the researchers together followed a series of systematic but non-linear steps adapted from Jabareen (2009) [60] to include the intrinsic knowledge from their professional experiences as well as their academic rigors: 1) compiling data from internationally published journal articles relevant to their respective fields since 2000, 2) categorizing and grouping the collected data, 3) combining the findings with their professional and field experiences 4) organizing the identified concepts, 5) categorizing and reordering the concepts as necessary, 6) integrating the selected concepts into a cohesive framework. 7) synthesizing and refining the framework, and 8) interpreting and adapting the resulting framework to ensure practical applicability in real-world contexts. One key researcher (PS) organized all the data and summarized the results based on the communications and reflexive journals collected during the process. Throughout the process, data collection and analysis were recorded and obtained through electronic communication exchanges and meeting records.

Results

The results are reported to highlight the steps of the discussion and conceptual framework development, which were categorized into three stages because of the method's non-linear nature. The stages include information and concepts (Step 1-4), emerging framework (Step 5-6), and synthesis for practical implications (Step 7-8).

Information and concepts (Step 1-4)

In the first part, each collaborators presented their literature within their field. We did not conduct a systematic review of literature. Instead, we conducted an exploratory narrative review [63,64] which made us understand the basis of the knowledge in our fields and arguments made within the scope of our study—which was nearby nature and older adults. Many studies focused on the mental well-being of older adults through frequent visits to green spaces and availability of green spaces [14,65-68]. Some observational studies also looked at physical outcomes such as bone density, cardiovascular diseases, and obesity risk [25,69,70]. Other studies investigated dementia and depression [17,35,71,72]. Some studies showed that elements of

walking in nearby nature such as the seasonal stories and availability of social contacts may be factors toward health [14; 15; 35; 65; 73]. For landscape architects, some guidelines and matrices were proposed for designs for older adults [2; 74; 75]. However, while there were bodies of evidence across different fields that nearby nature benefits the health of older adults, they could only be applied at the urban planning scales. Most studies, aside from the existing design guides, were too generic to benefit environmental designers in their professions. The gaps are reduced across the years, but there is much to discover.

After the literature and guidelines were collectively presented, the discussions involved the designers and researchers expressing their experiences in the design professions and fields. Overall, the six collaborators understand the basic concepts of landscape design and architecture for older adults. However, they have also added some flavors of experiences into the discussion. For example, a researcher identified the role of nature as a part of design because of how older adults usually have to stay in place for a long time due to mobility issues.

“... [Trees] are important in this case because if [older adults] cannot go anywhere for a long time, trees are more interesting than anything humans made. There are layers upon layers of leaves and stems. Lights and wind will make it change. Then birds, insects, and animals make them more interesting...”

A landscape architect expressed their experience that they could see themselves in the designs and reflected that all of us will eventually get old, and the lines between adults and older adults are arbitrary, they argued as follows.

“I don’t see why we should design for older adults in any different ways than we design for us. We will get old. It’s not like our preferences and selves die at the age of 60.”

This sentiment is reflected by another planting designer, who compared the guidelines of landscapes for older adults to guidelines for children and disagreed with some part of the guides accordingly.

“...[Older adults] are experienced adults. Aside from tripping on roots or fruits, they know what plant parts are poisonous and won’t put them in their mouth. They won’t go and play with unknown animals or

insects. They know more than us in many things, so we just see [these older adults] as a client. Then we design for them.”

However, cautions along with reduced physical and mental functions were discussed as well. One landscape architect noted the following.

“[Older adults] don’t see well in bright or dim light. They also can’t feel hot or cold as sensitively so they are likely to have pneumonia or heatstroke. We need to be extra careful with the choices we give them in our designs.”

In similar note, the environmental psychologist suggested the common experiences the older adults face, which might not be as common in other age groups.

“Imagine one day losing your job. One day you are a professor and then you are just a grandmother sitting at home with nothing to do. Imagine being able to run but suddenly you can’t. Imagine one day waking up to a body of your husband, cold and stiff, and deciding how to tell your kids. I can’t even imagine how to deal with that yet, but at one point we are designing for these people.”

From the literature and discussion, the researchers and designers identified seven key concepts that ones might consider while designing for the older adults. The key concepts are identified in Table 1.

TABLE 1

Key concepts identified from the literature and discussion [created by authors]

Concepts	Example keywords
Aesthetic	beautiful, preference, enjoy, pretty, complex, quality
Physical comfort	comfortable, bright, staying, pain, movement, tired, hot, cold, thermal comfort
Individuality	meaningful, experience, past, story, reflection, self, own person, activity, fun, expression
Social vs loneliness	friends, husband, wife, grandchildren, community, activities, visit, public, loneliness, dependent
Changes	death, wheelchair, retirement, loss, ability, purpose, accessibility, mobility
Senses	smell, touch, dull, soft, dim, sensitivity
Fear	poison, tripping, falling, care, death, sick, recovery, cancer, depression, anxiety

Emerging framework (Step 5-6)

Over the discussions, the finalized two key themes emerged: 1) designing for older adults as individuals—which focuses on how older adults are humans and are subject to typical design requirements for any person and 2) older adults as a stage of life—which focuses on how older adults face some common lived experiences, and struggles, as a population group. Of these two key themes, seven smaller themes were identified and refined from the concepts including aesthetics, thermal

comfort, personal experiences, social cohesion, embracing changes and losses, sensory perception, and risks. Of these themes, social cohesion was identified for both designing nearby nature for older adults as individuals and as stages of life (Figure 1).

Synthesis for practical implications (Step 7-8)

Together, the researchers and practitioners identified two groups of design recommendations for each theme: physical requirements and mental requirements. The design recommendations, organized by themes are shown in Table 2.

TABLE 2

Recommendations addressing key themes of designing nearby nature for older adults

Key themes	Older adults & nearby nature themes	Physical requirements (Mobility and accessibility)	Mental requirements (Feelings, perception, and emotion)
Older adults as individuals (Older adults are humans and are subject to typical design requirements for any person)	1) Aesthetics	- visually accessible with different geography and terrain. - be part of the neighborhood and the geological-cultural identities	- listen and incorporate the preference and of older adults within the cultures. - plant materials usually draw attention. - engage in distance appreciation of wildlife. - create impression and place attachment
	2) Thermal comfort	- create enough interplay of sunlight, shade, and wind for comfort. - provide nearby shelters (plants or architecture) from sudden changes in microclimate.	- place plants and architectural feature to allow interactions with sunlight and wind.
	3) Personal experiences	- use cultural elements, signifiers, and plants with cultural or historical significance	- discuss with the community you design for to understand more collective experiences - design elements that create connection, changes, and stories, i.e., plants that change with the seasons
Combination of two key themes	4) Social cohesion	- create green spaces and nearby nature as third places - locate nearby nature at accessible intersections between residents and daily functions	- create safe open spaces for older adults to sit - provide both wide open spaces for social bridging and smaller, more private intimate spaces for social binding.
Older adults as a stage of life (Older adults face some common lived experiences as a population group)	5) Embracing changes and losses	- emphasize places that are comfortable during daytime, where free time is accessible for older adults. - add winding paths and other elements for rumination and fascination. - universal design and wheelchair accessibility	- create spaces for new activities and sharing of experiences - create opportunities that provide giving back in different scales, such as birdbath, fruit trees, or squirrel feeders
	6) Sensory perceptions	- sufficient lighting. - hard and smooth pave surfaces for easy walking	- engage in multiple sensory engagements, such as visuals, sounds, and smells.
	7) Risks	- eliminate fall risks such as gaps and lack of railings. - avoid sharp corners and drastic changes in height - available and comfortable seating along distances - accessible in case of medical emergencies - avoid plant materials that are toxic to touching or have sharp thorns.	- open visible spaces to make the older adults feel safe. - sufficient lighting for both day and night. - provide cues of care and maintenance more than usual nearby nature - provide risk-reduction protocols, such as an emergency button.

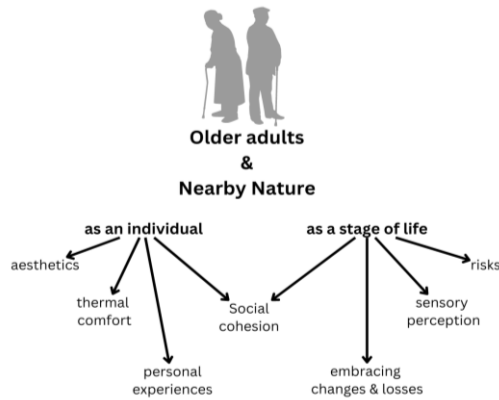


Fig. 1. Conceptual framework regarding designing nearby nature for older adults [created by authors]

Additional consideration:

Other design concerns for older adults

In landscape architectural and environmental design projects, there exist various forms of projects, objectives, and user types. In some design projects, older adults may not be the primary target group, resulting in challenges and obstacles in terms of accessibility. This is commonly observed in designs from previous eras that may not have sufficiently considered the diverse needs of users. It is not only the older adults who face such situations but also individuals with disabilities, wheelchair users, and families with strollers. Currently, landscape architecture and design are increasingly embracing the concept of universal design, which aims to create equal access and usability for people of all types [76]. However, the level of responsiveness to different user needs varies depending on the evaluation of satisfaction on a project-by-project basis. Factors such as adequacy of facilities, level of maintenance, and appropriate timing for construction play a role.

To address specific problems and challenges, it is necessary to focus on public spaces, particularly the lack of connectivity in usage. For example, issues related to ease of transportation and access to various functional areas are relevant. Even if a project is designed to accommodate usability, it does not necessarily promote efficient usage. Therefore, designers and relevant organizations should not solely prioritize project requirements but also strive to understand the broader environmental context.

Discussion

This study developed the two key emerging themes as guideline to design nearby nature for older adults from researchers and practitioners: older adults as individuals and older adults as a stage of life. From these themes emerged seven categories of recommendations: aesthetics, thermal comfort, personal experiences, social cohesion, embracing changes and losses, sensory perceptions, and risks. These can be developed into a design guidelines and

evaluation guidelines towards designing nearby nature for older adults.

Many themes from the guideline aligned with other guidelines and theories to create healthy and therapeutic landscapes such as stress reduction theory [24], the third place theory [77], attention restoration theory [30], and prospect-refuge theory [78]. It also addressed some key elements in senior-friendly park design guideline [7] with some differences, such as personal experiences, and expand upon the guideline to include suggestions from the residential scales.

This study is novel because it engaged the conversation between researchers and practitioners in the built environment design professions. Such interactions need to be done to exchange both scholarly and intrinsic knowledge necessary to develop a mature landscape architecture discipline. However, the research in this field, including this study, is still in its early stage and needs further development to contribute to the changes in the built environments towards healthy aging. Future researchers can use this guide to develop a hypothesis for future design, while future practitioners can use this guide as a toolbox to develop specific projects to address the needs of older adults in their nearby nature designs.

This exploratory study included a small group of researchers and practitioners with similar background: they are all researchers and practitioners affiliated in Thailand. Thus, while the results suggest similar answers to larger theories, geographical and cultural contexts may need to be included in future research. Comparison and testing of the conceptual framework may be needed to increase its validity and generalizability in the future.

Conclusion

This study aimed to develop design guidelines for creating nearby nature spaces for older adults, focusing on two key themes: older adults as individuals and older adults as a stage of life. Through discussions and collaboration between researchers and practitioners, seven categories of recommendations were identified. These recommendations can serve as a valuable tool for designers and practitioners in developing projects that cater to the needs of older adults. By engaging both researchers and practitioners, this study bridges the gap between scholarly knowledge and practical expertise, contributing to the maturation of landscape architecture as a discipline. Overall, this study provides valuable insights and recommendations for designing nearby nature spaces for older adults, promoting inclusivity, accessibility, and well-being in the built environment.

References

1. **Jiang, B.; Li, D.; Larsen, L.; Sullivan, W.C.** A Dose-Response Curve Describing the Relationship Between Urban Tree Cover Density and Self-Reported Stress Recovery. *Environment and Behavior* 2014, 26-36.
2. **Teixeira, A.; Gabriel, R.; Quaresma, L.; Alencão, A.; Martinho, J.; Moreira, H.** Obesity and Natural Spaces in Adults and Older People: A Systematic Review. *Journal of Physical Activity and Health* 2021, 18, 714-727.
3. **Coutts, C.; Hahn, M.** Green Infrastructure, Ecosystem Services, and Human Health. *International Journal of Environmental Research and Public Health* 2015, 12, 9768-9798, doi:10.3390/ijerph120809768.
4. **World Health Organization.** Decade of healthy ageing: baseline report. 2020.
5. **World Health Organization.** *World report on ageing and health*; World Health Organization: 2015.
6. **Rudnicka, E.; Napierała, P.; Podfigurna, A.; Męczekalski, B.; Smolarczyk, R.; Grymowicz, M.** The World Health Organization (WHO) approach to healthy ageing. *Maturitas* 2020, 139, 6-11.
7. **Loukaitou-Sideris, A.; Brozen, M.; Levy-Storms, L.** Placemaking for an aging population: Guidelines for senior-friendly parks. 2014.
8. **Pongprasert, P.; Kittiyanyanya, S.** Factors Influencing Senior Housing Selection of the Future Elderly Group in Bangkok. *Journal of Business, Economics, and Communications* 2021, 16, 49-63.
9. **Chanchang, P.** Quality of Life Improvement of Elderly in Bangkok. *Pathumthani University Academic Journal* 2011, 3, 66-78.
10. **Yeo, M.; Heshmati, A.** Healthy residential environments for the elderly. *Journal of Housing for the Elderly* 2014, 28, 1-20.
11. **Ceccato, V.; Bamzar, R.** Elderly victimization and fear of crime in public spaces. *International criminal justice review* 2016, 26, 115-133.
12. **Viwatkamolwat, N.; Boonpalit, A.; Keonil, N.** Study of Factors Affecting Longevity for Elderly Lodging Design. *Veridian E-Journal* 2017, 3, 2763-2774.
13. **Kweon, B.-S.; Sullivan, W.C.; Wiley, A.R.** Green common spaces and the social integration of inner-city older adults. *Environment and behavior* 1998, 30, 832-858.
14. **Nagel, C.L.; Carlson, N.E.; Bosworth, M.; Michael, Y.L.** The relation between neighborhood built environment and walking activity among older adults. *American journal of epidemiology* 2008, 168, 461-468.
15. **Gardner, P.J.** Natural neighborhood networks—Important social networks in the lives of older adults aging in place. *Journal of Aging Studies* 2011, 25, 263-271.
16. **Coyle, C.E.; Dugan, E.; health.** Social isolation, loneliness and health among older adults. *Journal of Aging* 2012, 24, 1346-1363.
17. **Dempsey, S.; Devine, M.T.; Gillespie, T.; Lyons, S.; Nolan, A.** Coastal blue space and depression in older adults. *Health & place* 2018, 54, 110-117.
18. **Suppakittpaisarn, P.; Jiang, X.; Sullivan, W.C.** Green Infrastructure, Green Stormwater Infrastructure, and Human Health: A Review. *Current Landscape Ecology Reports* 2017, 2, 96-110.
19. **Cox, D.; Shanahan, D.; Hudson, H.; Fuller, R.; Anderson, K.; Hancock, S.; Gaston, K.** Doses of nearby nature simultaneously associated with multiple health benefits. *International journal of environmental research and public health* 2017, 14, 172.
20. **Kellert, S.R.; Wilson, E.O.** *The Biophilia hypothesis* Island Press: Washington, D.C., 1993; p. 484.
21. **Rosenzweig, M.L.** A theory of habitat selection. *Ecology* 1981, 62, 327-335.
22. **Sullivan, W.C.** Forest, savanna, city: evolutionary landscapes and human functioning. *Urban place, reconnecting with the natural world*, The MIT Press, Cambridge 2005, 237-252.
23. **Ulrich, R.S.** Biophilia, Biophobia, and Natural Landscapes. In *The Biophilia Hypothesis*, Wilson, E.O., Kellert, S.R., Eds.; Island Press: Washington DC, 1993; pp. 74-137.
24. **Ulrich, R.S.; Simons, R.F.; Losito, B.D.; Fiorito, E.; Miles, M.A.; Zelson, M.** Stress recovery during exposure to natural and urban environments. *Journal of environmental psychology* 1991, 11, 201-230.
25. **Donovan, G.H.; Butry, D.T.; Michael, Y.L.; Prestemon, J.P.; Liebhold, A.M.; Gatzliolis, D.; Mao, M.Y.** The relationship between trees and human health: evidence from the spread of the emerald ash borer. *American journal of preventive medicine* 2013, 44, 139-145.
26. **Donovan, G.H.; Michael, Y.L.; Gatzliolis, D.; Prestemon, J.P.; Whitsel, E.A.** Is tree loss associated with cardiovascular-disease risk in the Women's Health Initiative? A natural experiment. *Health & place* 2015, 36, 1-7.
27. **Astell-Burt, T.; Feng, X.; Kolt, G.S.** Does access to neighbourhood green space promote a healthy duration of sleep? Novel findings from a cross-sectional study of 259 319 Australians. *BMJ open* 2013, 3, e003094.
28. **Taylor, M.S.; Wheeler, B.W.; White, M.P.; Economou, T.; Osborne, N.J.** Research note: Urban street tree density and antidepressant prescription rates—A cross-sectional study in London, UK. *Landscape and Urban Planning* 2015, 136, 174-179.
29. **Kardan, O.; Gozdyra, P.; Misic, B.; Moola, F.; Palmer, L.J.; Paus, T.; Berman, M.G.** Neighborhood greenspace and health in a large urban center. *Scientific reports* 2015, 5.
30. **Kaplan, S.** The restorative benefits of nature: Toward an integrative framework. *Journal of environmental psychology* 1995, 15, 169-182.
31. **Sullivan, W.C.** In Search of a Clear Head. In *Fostering Reasonableness: Supportive Environment for Bringing Out Our Best*, Kaplan, R., Basu, A., Eds.; Maize Book: Ann Arbor, Michigan, 2015.
32. **Matsuoka, R.H.** Student performance and high school landscapes: Examining the links. *Landscape and Urban Planning* 2010, 97, 273-282, doi:10.1016/j.landurbplan.2010.06.011.
33. **Li, D.; Sullivan, W.C.** Impact of views to school landscapes on recovery from stress and mental fatigue. *Landscape and Urban Planning* 2016, 148, 149-158.

34. **Li, D.; Deal, B.; Zhou, X.; Slavenas, M.; Sullivan, W.C.** Moving beyond the neighborhood: Daily exposure to nature and adolescents' mood. *Landscape and Urban Planning* 2018, *173*, 33-43, doi:https://doi.org/10.1016/j.landurbplan.2018.01.009.
35. **Moore, K.D.** Restorative dementia gardens: exploring how design may ameliorate attention fatigue. *Journal of Housing for the Elderly* 2007, *21*, 73-88.
36. **Kawachi, I.; Berkman, L.J.S.e.** Social cohesion, social capital, and health. 2000, *174*.
37. **Friedkin, N.E.J.A.R.S.** Social cohesion. 2004, *30*, 409-425.
38. **Coyle, C.E.; Dugan, E.J.J.o.a.; health.** Social isolation, loneliness and health among older adults. 2012, *24*, 1346-1363.
39. **Gerst-Emerson, K.; Jayawardhana, J.J.A.j.o.p.h.** Loneliness as a public health issue: the impact of loneliness on health care utilization among older adults. 2015, *105*, 1013-1019.
40. **Zajonc, R.B.** Feeling and thinking: Preferences need no inferences. *American psychologist* 1980, *35*, 151-175.
41. **Kaplan, R.; Kaplan, S.** *The experience of nature: A psychological perspective*; Cambridge University Press: London, 1989; p. 356.
42. **Suppakittpaisarn, P.; Chang, C.-Y.; Deal, B.; Larsen, L.; Sullivan, W.C.** Does Vegetation Density and Perceptions Predict Green Stormwater Infrastructure Preference? *Urban Forestry & Urban Greening* 2020, *55*, doi:https://doi.org/10.1016/j.ufug.2020.126842.
43. **Li, C.; Zhou, Y.** Residential environment and depressive symptoms among Chinese middle-and old-aged adults: A longitudinal population-based study. *Health & Place* 2020, *66*, 102463.
44. **Lee, H.J.; Lee, D.K.** Do sociodemographic factors and urban green space affect mental health outcomes among the urban elderly population? *International journal of environmental research and public health* 2019, *16*, 789.
45. **Browning, M.H.; Lee, K.; Wolf, K.L.** Tree cover shows an inverse relationship with depressive symptoms in elderly residents living in US nursing homes. *Urban Forestry & Urban Greening* 2019, *41*, 23-32.
46. **Hong, A.; Sallis, J.F.; King, A.C.; Conway, T.L.; Saelens, B.; Cain, K.L.; Fox, E.H.; Frank, L.D.** Linking green space to neighborhood social capital in older adults: The role of perceived safety. *Social Science & Medicine* 2018, *207*, 38-45.
47. **Dempsey, S.; Devine, M.T.; Gillespie, T.; Lyons, S.; Nolan, A.J.H.; place.** Coastal blue space and depression in older adults. 2018, *54*, 110-117.
48. **Garrett, J.K.; White, M.P.; Huang, J.; Ng, S.; Hui, Z.; Leung, C.; Tse, L.A.; Fung, F.; Elliott, L.R.; Depledge, M.H.J.H.; et al.** Urban blue space and health and wellbeing in Hong Kong: Results from a survey of older adults. 2019, *55*, 100-110.
49. **de Keijzer, C.; Tonne, C.; Sabia, S.; Basagaña, X.; Valentín, A.; Singh-Manoux, A.; Antó, J.M.; Alonso, J.; Nieuwenhuijsen, M.J.; Sunyer, J.J.E.i.** Green and blue spaces and physical functioning in older adults: Longitudinal analyses of the Whitehall II study. 2019, *122*, 346-356.
50. **Wen, C.; Albert, C.; Von Haaren, C.** The elderly in green spaces: Exploring requirements and preferences concerning nature-based recreation. *Sustainable cities and society* 2018, *38*, 582-593.
51. **Kearney, A.R.; Winterbottom, D.** Nearby nature and long-term care facility residents: Benefits and design recommendations. *Journal of Housing for the Elderly* 2006, *19*, 7-28.
52. **Vecellio, D.J.; Bardenhagen, E.K.; Lerman, B.; Brown, R.D.** The role of outdoor microclimatic features at long-term care facilities in advancing the health of its residents: An integrative review and future strategies. *Environmental Research* 2021, 111583.
53. **Suppakittpaisarn, P.; Larsen, L.; Sullivan, W.C.** Preferences for green infrastructure and green stormwater infrastructure in urban landscapes: Differences between designers and laypeople. *Urban Forestry & Urban Greening* 2019, *43*, 126378.
54. **Deming, M.E.; Swaffield, S.** *Landscape architectural research: Inquiry, strategy, design*; John Wiley & Sons: 2011.
55. **Nijhuis, S.; Bobbink, I.** Design-related research in landscape architecture. *Journal of Design Research* 2012, *10*, 239-257.
56. **Suppakittpaisarn, P.** *Research and Design in Landscape Architecture*; O.S. Printing House: Bangkok, Thailand, 2021.
57. **Thompson, I.** Aesthetic, social and ecological values in landscape architecture: a discourse analysis. *Ethics, Place & Environment* 2000, *3*, 269-287.
58. **Beecher, T.; Trowler, P.** Academic tribes and territories: Intellectual enquiry and the culture of disciplines. 2001.
59. **Cross, N.** Developing design as a discipline. *Journal of Engineering Design* 2018, *29*, 691-708.
60. **Jabareen, Y.** Building a conceptual framework: philosophy, definitions, and procedure. *International journal of qualitative methods* 2009, *8*, 49-62.
61. **Gu, Y.; Deal, B.** Coupling systems thinking and geodesign processes in land-use modelling, design, and planning. *Journal of Digital Landscape Architecture* 2018, *3*, 51-59.
62. **Greene, J.C.; Caracelli, V.J.; Graham, W.F.** Toward a conceptual framework for mixed-method evaluation designs. *Educational evaluation and policy analysis* 1989, *11*, 255-274.
63. **Pautasso, M.** The structure and conduct of a narrative literature review. *A Guide to the Scientific Career: Virtues, Communication, Research and Academic Writing* 2019, 299-310.
64. **Nukarinen, T.; Rantala, J.; Korpela, K.; Browning, M.H.E.M.; Istance, H.O.; Surakka, V.; Raisamo, R.** Measures and modalities in restorative virtual natural environments: An integrative narrative review. *Computers in Human Behavior* 2022, *126*, 107008.
65. **Rosso, A.L.; Auchincloss, A.H.; Michael, Y.L.** The urban built environment and mobility in older adults: a comprehensive review. *Journal of aging research* 2011, *2011*.
66. **Dempsey, S.; Lyons, S.; Nolan, A.** Urban green space and obesity in older adults: evidence from Ireland. *SSM-population health* 2018, *4*, 206-215.
67. **Garrett, J.K.; White, M.P.; Huang, J.; Ng, S.; Hui, Z.; Leung, C.; Tse, L.A.; Fung, F.; Elliott, L.R.; Depledge, M.H.** Urban blue space and health and wellbeing in Hong Kong: Results from a survey of older adults. *Health & place* 2019, *55*, 100-110.

68. **Huang, B.; Huang, C.; Feng, Z.; Pearce, J.R.; Zhao, H.; Pan, Z.; Liu, Y.** Association between residential greenness and general health among older adults in rural and urban areas in China. *Urban Forestry & Urban Greening* 2021, 59, 126907.
69. **Knobel, P.; Maneja, R.; Bartoll, X.; Alonso, L.; Bauwelinck, M.; Valentin, A.; Zijlema, W.; Borrell, C.; Nieuwenhuijsen, M.; Dadvand, P.** Quality of urban green spaces influences residents' use of these spaces, physical activity, and overweight/obesity. *Environmental Pollution* 2021, 271, 116393.
70. **Lin, J.; Leung, J.; Yu, B.; Woo, J.; Kwok, T.; Lau, K.K.-L.** Association of green space with bone mineral density change and incident fracture in elderly Hong Kong Chinese: Mr. OS and Ms. OS study. *Environmental research* 2021, 201, 111547.
71. **Detweiler, M.B.; Warf, C.** Dementia wander garden aids post cerebrovascular stroke restorative therapy: a case study. *Alternative Therapies in Health & Medicine* 2005, 11.
72. **Browning, M.H.E.M.; Lee, K.; Wolf, K.L.** Tree cover shows an inverse relationship with depressive symptoms in elderly residents living in US nursing homes. *Urban Forestry & Urban Greening* 2019, 41, 23-32.
73. **Joseph, A.; Zimring, C.; Harris-Kojetin, L.; Kiefer, K.** Presence and visibility of outdoor and indoor physical activity features and participation in physical activity among older adults in retirement communities. *Journal of Housing for the Elderly* 2006, 19, 141-165.
74. **Chang, P.-J.; Tsou, C.-W.; Li, Y.-S.** Urban-greenway factors' influence on older adults' psychological well-being: A case study of Taichung, Taiwan. *Urban Forestry & Urban Greening* 2020, 49, 126606.
75. **Han, B.; Li, D.; Chang, P.-J.** The effect of place attachment and greenway attributes on well-being among older adults in Taiwan. *Urban Forestry & Urban Greening* 2021, 65, 127306.
76. **Aslaksen, F.; Bergh, S.; Bringa, O.; Heggem, E.** Universal design. *Planning and Design for All. Oslo: The Norwegian State Council on Disability* 1997.
77. **Putnam, R.** Social capital: Measurement and consequences. *Canadian journal of policy research* 2001, 2, 41-51.
78. **Appleton, J.** Landscape evaluation: the theoretical vacuum. *Transactions of the Institute of British Geographers* 1975, 120-123.

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Kopsavilkums. Pasaules iedzīvotājiem novecojot, vides dizaina loma vecāka gadagājuma cilvēku veselības un labklājības veicināšanā kļūst arvien svarīgāka. Pētījuma mērķis ir izpētīt tuvējās dabas jēdzienu un tās iespējamās ieguvumus novecojošai sabiedrībai, koncentrējoties uz vecāka gadagājuma cilvēku īpašajām vajadzībām un vēlmēm. Pētījumā izmantota daudzdisciplināra pieeja, iesaistot pētniekus un praktiķus no dažādām jomām, tostarp vides psiholoģijas, pilsētplānošanas, augu zinātnes un ainavu arhitektūras speciālistus. Veicot sistemātiskus datu apkopošanas, kategorizēšanas un integrācijas posmus, pētījums identificē galvenās tēmas, kas saistītas ar plānošanu gados vecākiem pieaugušajiem kā indivīdiem. Pētījumā iegūtie rezultāti var kalpot kā vērtīgi instrumenti dizaineriem, plānotājiem un lēmumu pieņēmējiem, veidojot vidi, kas veicina gados vecāku cilvēku labklājību un dzīves kvalitāti pilsētās.