JOURNAL of DESIGN THINKING

Principles for Designing Age-Friendly Environments to Enhance Social Sustainability and Prevent Alzheimer's Among the Elderly

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DOI: 10.22059/JDT.2024.372123.1115

Received: *3 February 2024*, ***Revised:*** *15 February 2024*, ***Accepted:*** *19 February 2024*, ***Available Online*** *from 19 February 2024.*

Abstract

In societies worldwide, the elderly is esteemed cultural assets, shaping their lives profoundly. Understanding their psychology and social dynamics becomes crucial with age, necessitating effective support systems. Urban areas must adapt to the demographic shift towards an aging population by providing welfare services, fostering engagement and social responsibility, and enhancing life satisfaction. Urban parks serve as vital spaces for seniors, greatly influencing their well-being. This research investigates the physical and mental conditions of the elderly, focusing on Alzheimer's prevention and social sustainability through appropriate environmental design. Integrating design elements fosters greater engagement among the elderly, which is pivotal for promoting the well-being and social sustainability of aging communities. This study investigates the physical and mental conditions of the elderly, focusing on Alzheimer's prevention and social sustainability through tailored environmental design. Integrating design elements encourages greater participation among the elderly and promotes the well-being and social sustainability of aging communities. Employing a descriptive case study approach, a virtual questionnaire was distributed among individuals aged 40 to 75. Four proposed designs were prioritized using the Analytic Hierarchy Process (AHP). Analysis of 60 completed questionnaires revealed a significant correlation between intergenerational interaction and joint activities, particularly in childcare or joint activity with young people.

Keywords

Elderly, Alzheimer's, Social Sustainability, Urban Parks.

Introduction

Old age is a critical stage in life, and attention to the issues and needs of this stage is a social necessity. Global statistics, including those in Iran, indicate a continuous increase in the elderly population. Alzheimer's disease disrupts cognitive abilities such as memory, judgment, language, and decision-making, and leads to negative emotions, sleep problems, and disruptive behaviors such as social withdrawal, depression, restlessness, and aggression. With the progression of Alzheimer's, symptoms such as confusion and anxiety further exacerbate the problems. Disorders like Alzheimer's have detrimental effects on the elderly, causing disability and imposing significant healthcare costs. This issue is considered one of the fundamental challenges to the healthcare system and social structures in developing countries like Iran, which will experience the highest increase in the elderly population in the near future (Karimi & Pournasseri, 2015).

Global Aging

According to the World Population Prospects (2017), the number of individuals aged 60 and above reached 962 million in 2017 globally. It is expected that the number of elderly individuals will more than double by 2050 and triple by 2100. It has been reported that a significant portion of older adults worldwide are physically inactive, with 45% of Europeans being physically inactive at the age of 60 (Zhai et al., 2018).

The World Health Organization estimates that the elderly population will reach 2 billion by 2050 (the United Nations predicts 2.1 billion for the same year). This means that for every 5 individuals in the world, one will be elderly. The increasing proportion of the elderly necessitates that developing societies including Iran, prepare themselves for old age (Iran Statistical Center, 2017).

Definition of Elderliness

Linguistically, an elderly person is someone who has lived for many years. Years are filled with memories and experiences that have been acquired over time. The simplest way to define old age is to consider the number of years that have passed since birth. The larger older population can be divided into three subgroups based on the stage of life: young old (approximately 65-74), middle old (75-84 years old), and oldest old (85 years and above) (Table 1). Conventionally, in Iran, the age of 65 to 70 marks the beginning of old age as it aligns with the retirement age. The length and stages of human life can be divided into several stages.

Table 1: *Stages of human life, (Khazaei, 2012).*

1	Infancy	From birth to one year old
2	Early Childhood	1 to 6 years old
3	Late Childhood	7 to 10 years old
4	Adolescence	11 to 18 years old
5	Young adulthood	19 to 35 years old
6	Early middle age	36 to 49 years old
7	Late middle age	50 to 64 years old
8	Young-old	65 to 74 years old
9	Old	75 to 85 years old
10	Old-old	86 years old and more

The Status of the Elderly in Iran

In Iran, where the aging process, particularly rapid aging, is prevalent, the need for appropriate policies to control Alzheimer's disease is crucial. Individuals affected by this disease not only impact their families but also influence society.

While life expectancy at birth has increased by approximately 30 years since the 1950s, this country must develop appropriate plans and strategies to address Alzheimer's disease in future years.

While life expectancy at birth has increased by approximately 30 years since the 1950s, this country must develop appropriate plans and strategies to address Alzheimer's disease in future years. While developed countries have previously experienced the consequences of aging, developing countries are now facing them (Sheykhi, 2017). While the growth rates of the elderly population are similar for men and women, women experience a slightly higher rate of increase (Table 2).

Table 2: *National Census information (1966-2016).*

Year	Population (Individual)		Average annual growth (Percentage)	
	Female	***Male***	***Female***	***Male***
1968	778646	859376	-	-
1978	845825	925789	0.83	0.75
1988	1297989	1419780	4.12	4.37
1998	1842177	2135950	3.82	4.17
2006	2466210	2654833	2.96	2.20
2016	3755686	3658405	4.30	3.26

According to the classification of the World Health Organization, (Table 3) the elderly is categorized into three groups: young old, old, and oldest old. In Iran, more than 70 percent belong to the young old category.

Table 3: *National Census information (1966-2016).*

Age		Living in an urban spot			Total		
		Female	***Male***	***Male and Female***	***Female***	***Male***	***Male and Female***
Total	2006	100.0	100.0	100.0	100.0	100.0	100.0
Young Old 60-74 years old		74.2	75.0	74.6	74.4	73.3	73.8
Old 75-89 years old		24.3	23.8	24.0	24.1	25.4	24.7
Oldest Old 90years old and more		1.5	1.1	1.3	1.6	1.3	1.4
Total	2016	100.0	100.0	100.0	100.0	100.0	100.0
Young Old 60-74 years old		75.2	74.4	74.8	74.5	72.0	73.3
Old 75-89 years old		23.0	23.9	23.5	23.7	26.1	24.9
Oldest Old 90 years old and more		1.8	1.7	1.7	1.8	1.9	1.8

We are at the beginning of the 21st century, a century in which the global life expectancy at birth has surpassed 66 years. Each year, the world population increases by 1.7 percent, but this increase is 2.5 percent for the population aged 65 and above. This age gap in the global population composition is driving us towards aging. Our country, Iran, has also not been deprived of this demographic change. Statistical indicators show that the aging trend in our country has begun, and it is predicted that the median age of the population will increase by 10 years from 2006 to 2026 (Iran Statistical Center, 2017).

Differences between Elderly Women and Men

According to research conducted in various parts of Iran, including Tehran, there are significant differences in the quality of life between elderly women and men. It appears that men are relatively better off.

With the increasing number of elderly women, more measures need to be taken to protect them in old age (Sheykhi, 2017).

Meeting Diverse Needs in a Changing World

Design as a multidisciplinary worldwide field concerns the product and artifacts creativity, artworks visualization, product development based on manufacturing systems, and service design in which some aspects of social, sustainability, commercial and business, and culture are focused more than in previous decades. One of the primary goals of design is to prepare some new ideas and to develop proper options and different choices for people based on their needs and requirements (Sadeghi Naeini et al., 2023).

Addressing the Needs of Aging Populations

In designing spaces for the elderly, it is essential to consider their diverse needs, including livelihood, emotional well-being, recreation, meaningful engagement, and security. From an ergonomic standpoint, creating environments that accommodate physical limitations and provide appropriate infrastructure encourages active participation in society and reduces premature dependence. The concept of active aging, as advocated by the World Health Organization (2007), underscores the importance of promoting physical activities that enhance balance, strength, and mental well-being among older individuals (Zhai et al., 2018). Furthermore, population aging, driven by factors like decreased mortality rates and declining fertility rates, has led to significant demographic changes globally, including in Iran (Mirzaei & Shams Ghafourkhahi, 2007).

Role of Urban Spaces

The functional role of urban spaces as a place of public activities and various urban areas has existed for a long time. There is a close relationship between the cultural, social, and political development of a city and its urban space (Jafarnejad & Sadeghi, 2021). Human activities in the social, cultural, and political spheres guarantee the survival of collective life and the sense of citizenship that is expanded and manifested through the urban space. In other words, urban space is a place where face-to-face relations and public celebrations are held, and through the presence of these activities, concepts, such as citizen participation, civil society, etc. can be included (Pahlavani, 2022).

Importance of Attention to Senior-friendly Architecture

Architecture and urban planning are among the most critical elements related to the lives of older adults. Leisure time is often a significant part of an elderly person's life, and having leisure without engaging in activities can lead to depression. The presence of the elderly in homes and communities requires an initial response to their needs. To maximize the benefits of services and community for the elderly, the lives and attitudes of older adults should be carefully analyzed. Their physical and mental conditions, needs, and characteristics are factors that should be addressed in each phase of an individual's health, ultimately benefiting society. In architecture, not only specific principles and standards should be defined, established, and observed for this age group, but also a specific spatial model should be defined for these individuals (Karimi & Pournasseri, 2015).

Alzheimer's Disease

Alzheimer's disease is a progressive, irreversible brain disorder that gradually impairs memory, thinking skills, and eventually the ability to perform even the simplest tasks. In most cases, symptoms of this disease appear for the first time in the mid-60s, where individuals may begin by forgetting small things but eventually lose the ability to remember anything. The origin of this disease may be genetic, but other factors can also contribute to its severity. To date, there is no known cure for this disease, but implementing simple strategies can help prevent its onset and progression.

The Importance of Attention to Alzheimer's Disease

Alzheimer's disease is currently ranked as the sixth leading cause of death in the United States, but recent estimates suggest that this disorder may be the third leading cause of death in older adults, right behind heart disease and cancer.

Studies so far indicate that a multifactorial intervention, including regular exercise, and a healthy diet, along with improving cardiovascular risk factors, psychosocial stress, and major depressive episodes, may be promising in preventing cognitive decline (Rakesh et al., 2017).

Ways to Reduce the Risk of Alzheimer's Disease

Alzheimer's disease is a complex condition with several risk factors. Some factors, such as age and genetics, are beyond individuals' control. However, there are several factors related to a healthy lifestyle that can be controlled. The factors listed in (Table 4) are among the effective factors in reducing the risk of Alzheimer's disease.

Table 4: *Factors influencing the reduction of Alzheimer's disease.*

Regular Exercise	Engaging in regular physical activities such as Tai Chi is considered one of the most effective ways to reduce the risk of cognitive decline.
Social Interaction	The development and maintenance of a strong network of friends, engaging in activities such as volunteering, joining a social group, participating in group classes, leisure activities (e.g., gardening), cultural activities (e.g., rhythmic movements and music), and recreational activities are among the popular social activities for older adults and may have therapeutic effects on their mind and body (Yin Leng & Pyae, 2011).
Healthy Diet	Epidemiological studies indicate that the use of a Mediterranean diet reduces the risk of cognitive impairment and Alzheimer's disease.
Keeping the Mind Active	Individuals who continue to learn new things and challenge their brains throughout their lives are less likely to develop Alzheimer's disease and cognitive decline. Engaging in artistic activities such as painting, mental games like Sudoku or chess, board games, and puzzles, as well as gaining new experiences, can help prevent memory disorders, especially Alzheimer's.
Stress Management	Chronic or prolonged stress can exert significant pressure on the brain and increase the risk of Alzheimer's disease and cognitive decline. However, simple stress management tools, such as relaxation, meditation, yoga, engaging in enjoyable leisure activities like cycling, maintaining a sense of humor, laughing, exercising, listening to music, and practicing mindfulness can all help alleviate anxiety.
Yoga and Meditation	A study from 2012 demonstrated that just 20 minutes of yoga enhances the speed and accuracy of participants in memory tests. Yoga also helps maximize our oxygen intake, thus improving cognitive performance. Additionally, meditation contributes to the improvement of several cognitive functions, such as focus, memory, and learning.
Enjoying Nature	Spending time in nature is incredibly important for our emotional and physical well-being; it can even be considered a form of meditation. A study in 2008 showed that walking in a park leads to an increase in memory and attention compared to walking in a city. Additionally, maintaining a healthy weight, controlling blood pressure and cholesterol, and avoiding smoking can also be helpful in preventing early-onset Alzheimer's.
Music	In recent years, music therapy has gained attention as one of the most common therapeutic approaches, and it has been shown that music therapy reduces anxiety levels in individuals with Alzheimer's disease (Karimi et al., 2015).

Sustainable Development

Sustainable development is defined as social equality, equitable distribution of resources, and avoidance of deprivation-inducing activities, allowing residents to actively participate in society on social, economic, and environmental levels. Sustainable development is achieved when the economic, environmental, and social components interact with each other (Figure 1). Sustainable urban design means realizing aspirations and meeting the basic needs of all segments of society while enhancing the capabilities of present individuals without jeopardizing the abilities of future generations. Efforts to humanize space should be a priority for all designers, particularly for architects and urban planners, as it aligns with the objectives of ergonomic urban planning and architecture (Azizzadeh et al., 2014).

The Impact of Sustainability on the Lives of the Elderly

Currently, the idea of sustainable design is evolving toward altering user behavior (Sadeghi Naeini et al., 2022). Efforts to design a sustainable city, create suitable urban spaces, and ensure equality of opportunities for all members of society to promote mobility throughout the city and access to all urban spaces are essential requirements for societal growth and development. However, elderly individuals, being a significant part of the current society, are often deprived of these rights due to human factors such as their needs and limitations associated with aging. The design of a city, as a part of a community where the elderly is present, plays a crucial role in the well-being of the elderly. Designers are moving towards creating an environment that assists the elderly in overcoming their limitations (Ibn Ali Heydari, 2012).

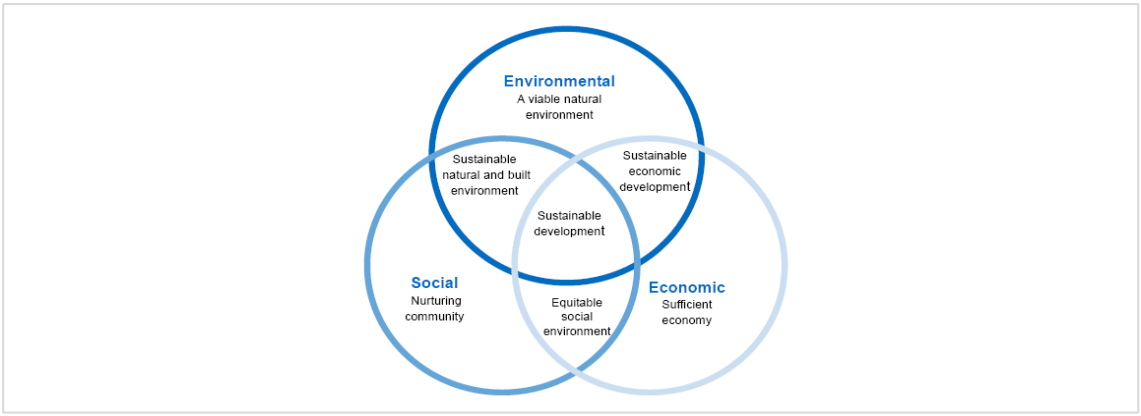

Figure 1: *Components emphasized in sustainable development (Newisar & El Naggar, 2014).*

Social Sustainability

The main goal of social sustainability is to improve living conditions and provide communities with the highest level of quality of life (Nastaran et al., 2012). There is a firm association between quality of life and social sustainability (Sadeghi Naeini, 2020). The emphasis in promoting social sustainability lies in addressing basic needs such as housing and income, individual capacities such as diverse job opportunities, and providing affordable cultural, recreational, leisure facilities and programs. It also emphasizes social capacities, participation, and the existence of spaces for artistic and social activities to develop social organizations and enhance balance among them. Design has recently been recognized as a key strategic tool for achieving social sustainability.

One of the aspects that architects should pay more attention to than in the past is social interactions in architecture. The social receptivity of architectural spaces can contribute to the development of social sustainability. A vibrant and dynamic city can be defined by various characteristics, with the most important being people's participation in city affairs, holding meetings, and creating opportunities for interaction among citizens. Another important aspect of social sustainability is the focus on human beings. Attention should be given to the human dimensions of public spaces, and the enthusiastic presence and participation of the people should be considered. Human-centered design, which is the focus of human factors engineering (ergonomics), examines the interaction between humans and the environment (Ibn Ali Heydari, 2012).

The Importance of Attention to Social Sustainability Regarding the Elderly

Today, the lack of necessary facilities in urban spaces has presented various challenges for the elderly to access urban amenities. The spatial disparities and lack of alignment with the needs and desires of the elderly have resulted in their isolation from society, which in turn has many negative consequences.

Therefore, modifying the environment and providing the necessary facilities in a way that allows elderly individuals to independently and freely use their surroundings without feeling endangered can create a suitable foundation for justice to be the focus of urban planning, facilitating social life and activities.

In other words, the quality of life and proportional access to urban facilities are essential requirements for sustainable urban development, and the elderly, as one of the vulnerable segments of society, need to be given special attention in this regard (Isalu et al., 2016).

The Impact of Urban Parks on Social Sustainability and Interactions

Urban parks and green spaces are among the most influential factors in shaping the social sustainability and cohesion of urban spaces. In public parks, efforts are made to provide recreational and welfare facilities that cater to diverse tastes, thoughts, and ages (Azizzadeh et al., 2014). Findings indicate that the emotions evoked by green spaces, especially parks, have a direct impact on psychological interaction, comfort, and daily life interruptions, all of which play a significant role in the quality of life, which is a key component of sustainable social development (Moradian et al., 2018). Attention to spaces designed to meet non-material human needs, providing an environment for contemplation, tranquility, and serenity, is essential. Neglecting the needs and desires of citizens leads to dissatisfaction among users, diminishes the sense of belonging, creates a sense of insecurity, and ultimately reduces the desire to be present and spend time in nature. Conversely, when nature captivates individuals, it reduces tension and nervous pressures (Razmara & Taghipour, 2019). In the modern era, the increase in modern living has resulted in a decrease in social interactions among citizens. Therefore, the importance of parks and urban green spaces in the life and social sustainability of the urban system is undeniable. For this reason, the presence of green spaces in cities, their proportional distribution, and the allocation per capita based on population needs are considered fundamental topics in urban planning and management (Moradian et al., 2018).

Methodology

In this study, the research methodology is a descriptive case study. To collect information and consequently find an appropriate solution and address the problem and objective of the project, we first conducted a library study on the elderly, their needs, and problems. Additionally, information was gathered about Alzheimer's disease, prevention methods, the social sustainability approach, urban parks, and their impact on the lives of the elderly. Then, statistics on the elderly and Alzheimer's disease were collected globally and nationally. Spaces with suitable uses for preventing Alzheimer's disease were identified for the population group. Subsequently, a site analysis was conducted, and by examining its collection and positive aspects, the reason for selecting it was justified. In this study and to gather field information, a virtual questionnaire was distributed among individuals aged 40 to 75, and ultimately, 60 individuals responded to it. The main target group in this questionnaire is young seniors, but the questionnaire approach includes activities related to the elderly with other age groups to provide an appropriate solution for the most ideal social participation that includes all age groups. Then, the questionnaire was analyzed. Four proposed plans were presented, and the Analytic Hierarchy Process (AHP) was used to prioritize among the proposed plans, selecting a plan with higher priority. In this study and to gather field information, a virtual questionnaire was distributed among individuals aged 40 to 75, and ultimately, 60 individuals responded to it. The main target group in this questionnaire is young seniors, but the questionnaire approach includes activities related to the elderly with other age groups to provide an appropriate solution for the most ideal social participation that includes all age groups. Then, the questionnaire was analyzed. Four proposed plans were presented, and the Analytic Hierarchy Process (AHP) was used to prioritize among the proposed plans, selecting a plan with higher priority.

Study Area

Mellat Park (Figure 2) in Tehran spans 34,000 square meters and runs parallel to Valiasr Street, one of the city's main thoroughfares. Adjacent to prominent landmarks such as the Enghelab Sport Complex and Broadcasting Building, and the Mellat Cinema Complex, the park offers accessibility via BRT, metro, taxis, and private vehicles.

Situated in District 3 of Tehran, it's noted that only certain areas (22, 20, 19, 18, 16, 6, 3) possess sufficient green spaces relative to their population, highlighting a significant shortage in other areas (Ziyari et al., 2012).

Figure 2: *Tehran Mellat Park.*

Findings

In this study, a total of 60 completed questionnaires were examined, with 62% being filled out by females and 38% by males (Figure 4 & 5). Spearman's weighted correlation analysis, a statistical method used to examine relationships between variables, has demonstrated a significant link between intergenerational interaction, such as child care or joint activities with young people, and various aspects of older adults' well-being (Figure 3). For instance, older individuals who engage in relationships with other generations often experience encouragement for active aging, motivating them to remain physically and mentally active. This social connection, whether through participating in activities with younger family members or joining social groups and events, has been shown to improve both physical and mental health in old age. Moreover, engaging in conversations and social activities provides consistent cognitive stimulation, which is essential for maintaining brain health. Regular mental exercises during these interactions, such as recalling memories, sharing stories, and problem-solving, can help sustain cognitive function over time and potentially reduce the risk of Alzheimer's disease. Furthermore, a significant relationship was found between daily physical activity and walking or gardening. Older adults who engage in daily physical activities, such as walking or gardening, may have a lower risk of developing Alzheimer's disease compared to those who are less physically active. This emphasizes the importance of staying active throughout life as a potential preventive measure against dementia and Alzheimers disease.

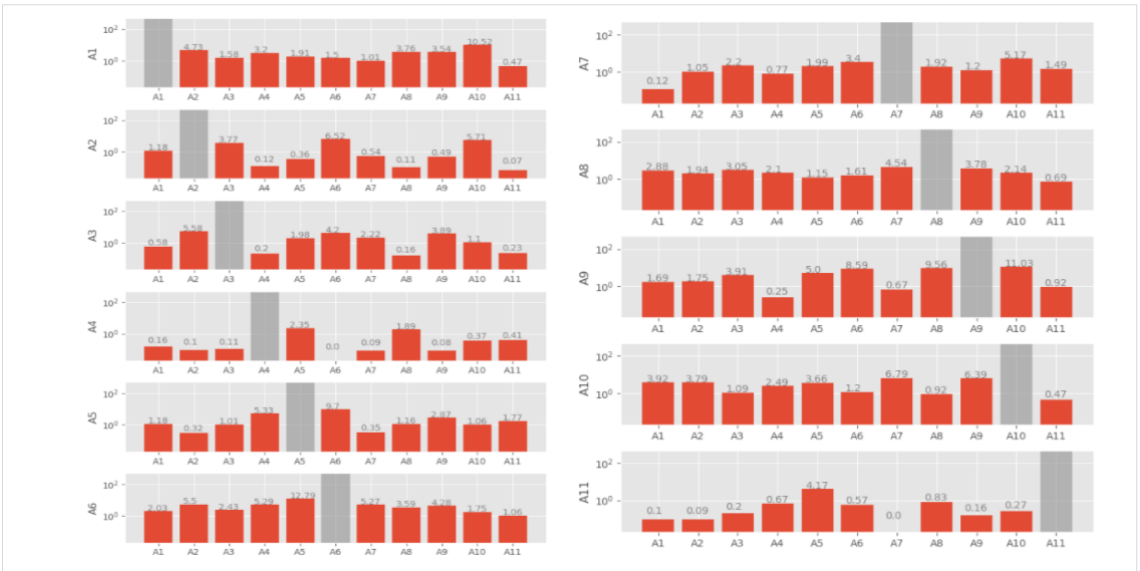

Figure 3: *Spearman statistical weight analysis Questionnaire (Source: Author).*

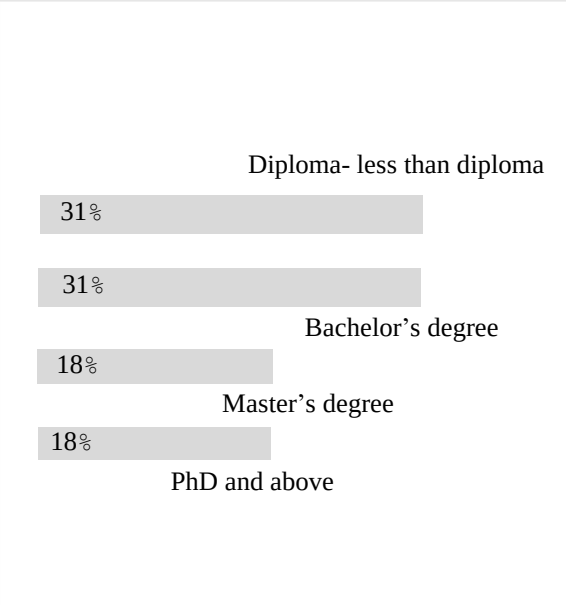

Figure 4: *Education level of the participants in the questionnaire (Author).*

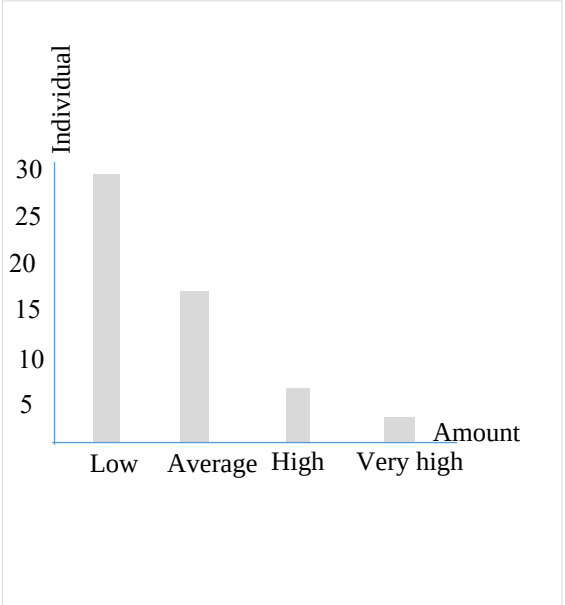

Figure 5: *The level of concern about the incidence of Alzheimer's in participants in the questionnaire (Author).*

Conclusion

Despite Alzheimer's disease being a complex and potentially threatening condition, with factors such as age and genetics beyond individuals'control, there are still factors for a healthy life that can help prevent memory disorders, especially Alzheimer's. Keeping the brain active through mental activities, preventing sedentary behavior and maintaining a healthy body through physical activities, maintaining happiness and reducing stress through recreational activities, preserving social connections through social interactions with peers and other generations, and consequently enhancing a sense of worth and self-confidence in individuals while preventing depression. City parks, considering that they serve as a gathering place for most elderly individuals who spend their leisure time there during the day, play a significant role in promoting the mental and physical well-being of older adults. These spaces hold great value in terms of the presence of green spaces and natural light, which is vital for the elderly.

Furthermore, city parks have high value in social sustainability and are designed to be accessible to all sections of society. In public parks, efforts are made to provide a wide range of entertainment and welfare facilities that cater to diverse tastes, thoughts, and ages, inviting individuals to socialize with peers and different age groups. They can serve as suitable platforms for providing activities and appropriate entertainment for this generation, thereby promoting active aging and maintaining a healthy community. Adequate social relationships can mitigate urban problems and issues, and in return, increase the sense of social security, satisfaction with neighborhood hygiene and cleanliness, a strong sense of identity and belonging, livability, and urban life, and improve urban management performance. Additionally, Mellat Park, due to its surplus green space relative to the population of the area and its easy accessibility, appears to be a suitable space for designing an environment for the elderly with a focus on social sustainability to prevent the onset of Alzheimer's. Therefore, the following proposed solutions are presented (Table 5).

Studies have shown that active participation of the elderly in the mentioned various activities plays a vital role in preventing early-onset Alzheimer's disease among older individuals. Engaging in community-based activities enables the elderly to participate in diverse tasks, fostering brain health and uplifting their overall well-being. Consequently, designing a space that incorporates a range of mentioned activities promotes active aging and contributes to reducing the risk of early Alzheimer's disease.

Table 5: *Suggested research solutions (Source: Author).*

Physical Activities	Gardening - walking - Golf - Yoga, meditation - Tai Chi - Cycling - Dancing - Fitness - Weight lifting Machines - Moderate intensity aerobic exercise, such as Aerobics
Mental Activities	Solving tables - Sudoku - Puzzles - Board games - Playing cards - Reading books and newspapers - Painting and Drawing, Sculpture - Strategy games like puzzles - Playing or listening to music - Learning a new skill
Recreational Activities	Singing - Reminiscing - Arts and Crafts - Watching Movies or Theater - Looking at past photos - Cooking with each other - Exploring the green space - Socializing and talking with friends - Watching children while playing - Making plans during events
Intergenerational Social Interaction	Playing with children or taking care of them (reminiscing) - Playing or hanging out with young people and doing joint activities with them - Selling self-made handicrafts - Inviting other age groups to the site such as a cafe for the general public - Participating in events and organized celebrations with the general public - Holding an exhibition of users' artworks - Teaching skills by the elderly to the younger ones such as Knitting - Holding group meetings - Joining a social group
Stress Management	Listening to relaxing music - Using soothing scents - Keeping a sense of humor - Funny group therapy session - Listening to nature sounds - Joining a friendship network
Medical Services	Clinic to check health and provide health solutions (nutrition and exercise) to young elderly, Control Blood Pressure and Diabetes
Points of Consideration in Design	Maintaining the connection of the elderly with nature and natural light - Furniture that can be moved for activities in common areas and adjustable for all kinds of needs - Prohibiting motorcyclists and cyclists from entering the sidewalk - Widening the sidewalks - Using smooth surfaces and creating unity in flooring - Providing Safety in crossing - Increased lighting at night - Open space suitable for this age with beautiful views - More seats to promote recreational and mental games - Easy navigation and ease of access
Social Sustainability	The sociability of the architectural space - the flexibility of the space - Creating Mental and Physical security by creating spaces suitable for the physical limitations of the elderly - Maintaining individual independence in public parks - Trying to ensure that all entertainment and comfort facilities are available for almost any taste and thought and age - Paying attention to collective and individual activities (selectivity of activities for individuals)

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