Creating Successful Elder-Friendly Spaces: A Conceptual Framework for Urban Public Spaces

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Abstract

Background: Although issues of elderly people's active life in public spaces are increasingly being reevaluated, the amount of research dedicated to enhancing urban public space qualities based on the concept of elders' preferences is still limited.

Methods: This study aims to identify the elders' preferences specially their use of public open spaces in residential neighborhoods. The research applied in two steps; first, Grounded Theory (GT) is conducted through semi-structured interviews. 52 in-depth interviews are conducted with the elderly.

Results: The analyzed data will then be examined to extract the main categories. Second, the survey is conducted through a questionnaire developed by authors, inquiring 350 elder people and analyzed by SmartPLS technique to validate the results of the developed model

Conclusion: The model of the elders' preferences consists of Places Functional (PF), Places Preferences (PP), and Process in Environments (PE). The findings will highlight both their theoretical and practical implications for urban planners and designers.

Introduction

The proportion of elder individuals ≥ 65 is expected to grow exponentially from 524 million in 2010 to approximately 1.5 billion by 2050 (1). Their life expectancy is on an increase, in parallel with an increase in their lifestyle which is no exception to that of any given society. Emphasizing the increasing needs of elders such as their presence in the public arena is a new challenge for the development of public open spaces in the 21st century (2).

Elder people are vulnerable to environmental influences due much to their apparent physical limitation (3). World Health Organization (WHO) launched the Global Age-Friendly Cities project which was widely accepted worldwide by the policymakers in urban environment projects (2). Global Strategy and Action Plan engages suggests that providing safe, inclusive, and accessible public spaces is necessary to engage elders to participate in public life (4, 5).

Recent studies have confirmed the importance of urban spaces to promote the well-being and active aging of elderly people. There exist many approaches in devising age-friendly environments, ranging from an emphasis on physical environment and infrastructure to the quality of social relations that promote their participation in social activities (6). Thus, it is important to identify the features that would promote the quality of the built environment with respect to the elders' needs for achieving a healthy and active aging society (7, 8). In fact, it is necessary to investigate the relationship between already constructed environments and the elders' public health and physical activity.

Public spaces contribute to age-friendly environments while they are not fully addressed in urban studies as an important spatial scale (4). Apart from defining successful age-friendly environments, there is an

absence of explanation for identifying which environmental features are essential. Moreover, explanations of space qualities in built environments that could effectively enhance the engagement between elder users and the environment are missing(7, 8). In addition to the spatial scale of such studies, most of the studies are based on the top-down decision-making, and often involve planners and policy-makers to assess their community against established criteria or checklists such as the guidelines developed by the WHO without studying users' preferences (9). In fact, in much of the existing literature on aging studies in different nations, especially developing countries, the preferences of elders' life remain unidentified (10, 11). It is essential to devise approaches for assessing the opinions and preferences of elders in actual urban places (12). Hence, to address the actual needs of elders as to age-friendly environments more studies are required with contextual focus and grounded approaches(9).

According to the reports by Tehran Municipality in 2015, although Iran has joined the group of 33 countries who are involved in actualizing age-friendly cities, the infrastructure is not appropriate in its context (13, 14). The crowded streets with heavy traffic prevent elders' easy and safe commute. Urban planning projects have not considered easy access to public transportation at a low cost for elders. What makes the elders' contribution to social relations arena is their accessibility to the facilities they need (15).

As it was gathered, gaps exist between the theoretical findings presented in previous studies and the ongoing development of age-friendly public spaces in practice. The aim of this paper is to narrow the gap between the theoretical findings from past studies and current public space development through exploring the environmental preferences of elders in public spaces in Tehran. For this purpose, a framework is presented to develop the age-friendly public spaces. The study uses mixed method research in two phases. In the first phase, an exploratory and qualitative approach has been done to identify the elders' preferences of public spaces based on semistructured interviews, and then it undertakes a quantitative approach along with structured questionnaires to answer the question: what dimensions and attributes of the built environment make public places more desirable for elders?

Theoretical Background

The demographic aging trends increase the demands for the elderly to be more fully integrated into society. The literature review here examines an integrated model of an age-friendly environmental space and age-friendly environment. The new concept of the age-friendly environment became globally known when WHO introduced the age-friendly cities guide (2), wherein an age-friendly city actively encourages and optimizes opportunities for health, participation, and security to enhance the elders' quality of life. The quality of the built environment is a crucial determinant of whether the elders with a given level of functional capacity can undertake the activities that are important (2, 16).

2-1 - Age-Friendly Environment

There is no universally accepted definition for the concept of an age-friendly community. The core of this concept, namely, the elders are valued participants in society and require a wide range of supports and

services to remain independent and healthy and enjoy a high quality of life. According to Alley et al. (2007), an age-friendly place is a place where elder people are actively involved, valued and supported with infrastructure and services that are effectively tailored to meet their needs (17). Similarly, WHO defines age-friendliness in terms of a community where policies, services, settings, and structures support and enable people to age actively (2). As a pioneer in such projects, the Canadian Government adopted this model more widely and used the term age-friendly community in many policy documents (18). In the UK, policy-makers apply the concept of lifetime neighborhood when referring to the construction of a favorable environment for elders (19, 20). The varying terminology is a manifestation of a range of emphases and approaches among researchers and practitioners within this context.

The common feature in age-friendliness conceptualization is the necessity to address the physical and social environments (21). According to Lui et al. (2009), there are many different approaches as to how the favorable environments for elders, ranging from an emphasis on physical infrastructure on the one hand, and the quality of social relations on the other may be sustained which would promote participation (21). Such issues highlight the importance of the social environments which are not less important than the physical conditions in determining well-being (22).

Feldman and Oberlink (2003) define four domains for an age-friendly environment: identifying the necessities, encouraging social and civic engagement, improving independence among the frail and disabled elderly, and optimizing physical and mental functioning and well-being (23). According to Lai et al (2016), an age-friendly environment is significantly linked to active aging and social connectedness where the features of outdoor spaces and buildings, transportation, housing, social participation, respect, civic participation and employment, community support and health services, and communication and information are positively related to age-friendly environments (11). WHO determines the most important features of the age-friendly environment are transportation, housing, social participation, respect and social inclusion, civic participation and employment, communication and information, and, finally, community support and health services (24). As active aging is defined in light of health, participation, and security (24), it can be perceived as the “desire and ability of elders to become integrated into the daily physical activities daily routines together with engaged in economic and socially productive activities” (25). Through in-depth personal interviews, Franke et al. (2013) revealed that self-help strategies, social connectedness, and physical environment promote physical activities among active elders (26). The Advent-Age Initiative launched recently defines an elder-friendly community as being where first the basic needs like housing, safety, information about civic services; social and civic engagement are met, and second, the physical and mental health and wellbeing are assessed, which in turn maximize the independence of frail and disabled individuals by providing accessible transportation, and supporting family, etc (11).

2-2 - The elder in public space

Seniors are encouraged to stay physically active outdoors. Existing literature has demonstrated that more engagement with green public spaces improves one's overall well-being (27, 28). Open spaces promote

active living, while physical active lifestyles, social integration, and mobility are important factors that contribute to successful aging (29). Sugiyama and Thompson (2007) claim that outdoor environments have many advantages for elders like the physiological benefits needed for enhancement of physical health. The sense of belonging is contributive in the sense of identity and well-being and facilitates successful adaptation as one gets old (30). Yung (2016), in this respect, made an attempt to identify the important planning and design criteria of public open spaces for elders who are living in dense old districts in Hong Kong (5).

Social interaction is a significant mechanism underlying the relationship between environmental interventions in public space and elders' social health. This interaction can reduce the risk of dementia and depressive symptoms and enhance the sense of value, purpose, identity, sense of belonging as well as security (31). Pasaogullari and Dorati (2004) emphasis on the important role of public spaces in enhancing social interaction and enhancing the elders' sense of community and safety (32). Results of another study on elders' preferences indicate that they consider social and physical activities, community living facilities and services and social network, and a clean and pleasant environment are their most important needs (8).

Contact with nature promotes health and well-being, as indicated by positive effects on blood pressure, cholesterol, outlook on life, and stress reduction (33). The possible reasons for the positive effects include improvement in air quality, stimulation of physical activity, facilitation of social contacts, and restoration and reduction of stress (34). Zhu et al. recognized the following six evaluation attributes as main features of built environments effective in active aging: legibility, interior to exterior connection, barrier-free sidewalks, route patterns sufficient lighting and traffic calming (7).

The related literature is also concerned with the governance processes necessary for defining and building age-friendly communities (35, 36). This process calls for the bottom-up participation and involvement of the elders in reflecting their concerns in the decision-making and planning process. Previous experiences suggest that the elder is often the last to be engaged when it comes to decision-making processes within their neighborhoods (37); while a framework for studying the age-friendly environment requires a combined analysis, running on the elders' preferences besides the economic and social forces influencing the cases in urban environment changes (6).

Method

This study uses exploratory mixed-method (Creswell, 2013) and according to Greene, Caracelli, and Graham (1989) mentioned in purpose aspect, it considers mixed methods as development category (38, 39). Figure 1 shows the overarching methodology of the research in two phases which are explained in more detail as follows (Fig. 1).

3-1 - Phase 1: Qualitative Research

A qualitative study is conducted using grounded theory (GT) data analysis method to explore the preferences of elders regarding the place quality. This approach is rooted in symbolic interactionism doctrine or symbolic convergence, considered as a field research method. The grounded theory is based on the concept that people who have experienced similar conditions express common definitions and behaviors (40).

3-1-1 - Sampling and Data Collection

The participants are selected using purposeful sampling in different public places in Tehran. Iran is experiencing a rapid momentum in population aging. This population constituted (≥ 65) made 20% of the total population in 2016, and the statistical predictions refer to a 25% growth by 2025 (14). To conduct the semi-structured interviews, participants are selected with respect to the maximum variation of age, literacy, gender, and self-rated health. Participants are in categories of illiterates, postgraduates, female and male, disabled and ill, good health to poor health (self-reported health conditions). The inclusion criterion is fit the age category of 65 and up, residing in Tehran, being present more than three times a week in outdoor spaces, and the desire to participate in the interview.

The place and time of the interviews are determined by the participants. Totally, 52 in-depth interviews up to theoretical saturation are run in spring 2018 (Table 1). The participants' age is within 65 to 85 range. The duration of the interviews is 30 to 45 minutes depending on the participant's level of interest and cooperation. The participants are asked questions about the features of appropriate and likable public spaces. The main questions together with some of the questions are mentioned in Table 1.

Moreover, a Focus Group Discussion (FGD) with 12 older peoples (7 women and 5 men) among interviewees was held for trustworthiness in the City Council of District 10 in Tehran Municipality in July 2018. After conducting the FGD in Tehran city council and finalizing the data gathering process, the data are analyzed through qualitative content analysis in the next step (41) (Table 2).

3-1-2 - Data Analysis

All interviews are recorded, transcribed, approved by the participants and then analyzed line by line. The analysis is run according to the method suggested by Corbin and Strauss (40). Data collection and analyses are run in a way that data from each interview is analyzed before the next interview is run. Unanswered questions from the prior interview are emphasized more in the next interview. Accordingly, the first interviews addressed the questions of the next interviews (40).

Three types of open, axial, and selective coding are applied in this study. All interviews are reviewed line by line and repeatedly in the open coding stage and the coding is made by the researchers by applying the related keywords and phrases. A total of 120 initial codes are extracted at this stage. A total of 69 concepts, 15 subcategories are identified after continuous comparison of codes in the axial coding stage. Three main categories in two dimension are determined in the selective coding stage after comparing the subcategories of the previous stage (appendix 1).

The collected data are also analyzed by going through MAXQDA 2010 software (42), which offers support for different approaches of combined qualitative and quantitative data and allows for a free analysis of an increasingly diverse range of data types (43) (44). The extraction of codes and categories in MAXQDA is controlled by the user before, during and after the data have been analyzed. The last two interviews and a FGD are run after reaching the theoretical saturation for more certainty.

The credibility of data was assured through peer checking and member checking (45). Peer checks were conducted via weekly research team meetings during which the emerging data were discussed and reviewed and analyzed within the research group. Member checks occurred by providing a summary of the analyzed interviews and extracted codes to participants so the research team could incorporate their feedback and ideas into revisions and corrections. The conformability was observed by considering the opinions of other researchers while transferability was checked by fully describing all the stages of the procedure (46).

The Ethical Committee of the Iran University of Medical Sciences (47) approved the method used in this study. The ethical procedures for the study assured the confidentiality and autonomy of the participants by these two points that all participants were informed of the purpose of the study and the voluntary nature of their participation and all consented to record their interviews by the interviewers.

3-2 - Phase 2: Quantitative Research

To define a framework in the quantitative phase, a questionnaire is formed based on the initial concepts emerging during the qualitative phase to be used in survey instrument development. A brief 50-item scale is devised to measure the elders' preferences of public spaces based on a 5-point Likert-type scale (almost always, often, sometimes, seldom, and never).

To ensure face and content validity in this empirical analysis of the constructs, the extracted items in phase one are first passed to 18 academic scholars with Ph.D. in urban design, urban planning, gerontology, and geriatrics to review the developed instrument scale; and only then to be used for a pilot testing with a small number of elder individuals (32 people) who reside in Tehran. The results led to the modification and deletion of some of the items in the questionnaire. Some of the original items are not suitable in the context of old people and are modified so much so that they would match the results of the experts' reviews as well as those of the pilot study. For example, survey questions about the wayfinding and fear of falling make the senior worried about their health conditions.

The scale's questionnaire of the elders' preferences in public space is based on the construct scales extracted the GT study. The scale tested three sub-dimensions of the elders' preferences: place function, place preferences, and process environment. A range of 19 items was used to measure place function, while place preference is measured by 11 items. The final list of 11 items covered all process environment (i.e. social environment, cultural environment, sense of belonging, and life satisfaction). The rest of the items were arranged to collect socio-demographic data.

In addition, the completion of questionnaires was followed by a short face-to-face interview, aiming to gain feedback from urban seniors about public space conditions. Every interviewee was informed of the result of this study at the beginning of the survey.

3-2-1 - Study population

A total of 350 elders (≥ 65 years of age) who attended public spaces (streets, squares, and parks) at least three times a week in outdoor spaces in neighborhoods in district 10 of Tehran constituted the statistical population through purposeful sampling (non-random sampling). These 350 participants participated in this study in August and September 2018 (Table 3). Elders with severe physical disability and communication difficulties excluded from this study. Nine trained researchers performed face-to-face interviews. Ethical approval of this study granted by the Ethics Board of the Iran University of Medical Sciences (IUMS) and all study participants have formally consented to this research.

3-2-2 - Data analysis

In the next stage, to estimate the proposed relations in the research model, the Structural Equation Modeling (SEM) was used. The SEM is currently used in urban studies probably due to the availability of several statistical software (48). SEM is a confirmatory statistical method, based on a linear relation among variables, allowing the substantive theories to be tested by considering the potential errors of measurement in all, including the independent variables observed (48). The SEM approach is comprehensive in testing the hypothesis regarding the observed indicators and latent variables. In SEM, the causal relationships among the latent variables, causal effect and the developed and non-developed variance level are determined(49). In this model, the relation between the exogenous and endogenous variables are of concern.

Results

4-1 - Phase 1: Qualitative Research

According to the full process related to the GT study, the two dimensions of place and process are identified through the elders' experiences of desirable public spaces. In open coding, the primary categorization of codes is made based on commonalities (Table 4). The core variable in this study is the elders' preferences of the built environment. Studying these two dimensions shows that they can be presented in three main categories of Places Functional attributes (PF), Places Preferences attributes (PP), and Process Environments (PE). Results show that the participants experienced 15 major subcategories related to these three main categories. Specific dimensions associated with each domain and the number of interviewees addressing them are tabulated in Appendix1. Table 4 also indicates the scores of participants for each concept (Table 4).

4-1-1 - Place Dimension

This category includes two subcategories of PF and PP which are discussed as follows. The places functional attributes (PF) included 49 final codes and seven domains of density, amenities (access to services), safety (traffic), aesthetic (environmental aesthetic), urban landscape, comfort, and cleanness. Almost half of the participants believe that place conditions, as well as the balance between the determinants and components of living condition in a rational context, are very influential.

"If there was a place wherein the individual could attend in a suitable and natural environment with water and plants and wouldn't have to continuously compete, or feel safe and comfortable, then I would definitely have time to think about adequate walking and exercise. Otherwise, feeling unsafe, traffic and litter continuously face different kinds of stress... this way, no time remains for being in the place." (Participant ID. 1020, a 72-year-old woman).

The places preferences attributes (PP) includes four subcategories of security (crime), controlling the fear of falling, ability to way-finding and aesthetic features (place image). The majority of the participants confirmed the perceived fear of crime, falling and getting lost (way-finding) which affect the presence and walking in the streets, squares, and parks.

"I know that exercise and walking prevent osteoporosis. I'm 69 years old and don't have back pain or limb pain. I'm surprised when youngsters say their leg hurt or backache. I used to exercise from an early age with benefits both in the spiritual and physical sense. Now I am afraid of falling due to the bad quality of pavement..."(Participant ID. 1016, a 65-year-old man).

This participant also added:

"...man is like a bicycle, when –immobile, the balance is lost, that is if you don't move you can't keep your balance. I always choose secure and ordered places to walk"

4-1-2 - Process Dimension

This dimension consists of four final subcategories of the social environment, cultural environment, sense of belonging and life satisfaction. According to most participants, having social interaction and civic participation next to meeting friends (social environment), culturally appropriateness (gender separation and limitation for pet in public spaces), belongingness to place, sense of rootedness and sense of being at home are associated to emotional feelings to place which have a positive impact on being presence and participation in social activities. Some of the participants believe that social interactions make their attachment (social and cultural) to the community and public place more significant.

In this regard, participant ID. 1023, a 67-year-old retired man said:

"The benefit of walking in the park is that it is both good for your health and that it lifts your spirits when you meet your friends... What's the use of sitting at home and feeling alone? I feel this park as my own yard?"

Moreover, participant ID.1017, a 69-year-old retired teacher described the spiritual impact on feeling good when active in the community:

"Whenever I meet my friends and help them when I go to bed I say "God, thank You a million times; today I did this and that ..." This way I become connected to the One above. That's when I feel better and healthier..."

4-2 - Phase 2: Quantitative Research

In this phase, to analyze the accuracy and validity of the extracted dimensions of the developed framework, the PLS-SEM analysis is implemented using 'SmartPLS 3.0' for the PLS-based path modeling (50). In this analysis, factor loading values of 0.70 or higher are preferred, and 0.4 or higher are acceptable for exploratory research (51). The results show that reliability indicators are close to the preferred level of 0.7 in this study. The Average Variance Extracted (AVE) should be 0.5 or higher, composite reliability should be 0.7 or higher, and 0.6 or higher is acceptable for exploratory research (52). Table 5 shows the results, and all of the constructs met these conditions.

For discriminant validity, the square root of AVE of each latent variable should be greater than the correlations amongst the latent variables (53). As table 6 shows, all constructs used in the empirical analyses met this condition.

4-2-1 - Structural Equation Model Results

The SEM is applied to determine the correctness of the study hypothesis by applying Smart PLS (54). The proposed model is constructed of two main hypothesizes:

H1. The dimensions of the place include function and preference positively influence the elders' preferences in public space.

H2. The dimension of the process environment consists of the social environment, cultural environment, sense of belonging, and life satisfaction positively influence the elders' preferences in public space.

Here, by determining the structural correlation among the concept variables, the hypothesizes 1 and 2 are assessed. The results here are shown in their standard sense in Fig. (2). To estimate the proposed effects in this research model, a bootstrap re-sampling routine is conducted, and Fig. 2 and Table 7 show the results of the structural model assessment. All the significant path coefficients are highlighted in this figure.

The results indicate that place had a significant positive impact on the elders' preferences in public space (path coefficient = 0.548, $p < 0.01$), while the effect of place dimension is insignificant on the elder peoples' desires in outdoor spaces. This would imply that place function and place preference captures well the old residents' perception of their active involvement and presence in public spaces (Fig. 2).

Thus, the results partially supported hypothesis 1 that place dimension (function and preference) is positively related to elder residents' presence in their neighborhood open spaces. This finding is relevant for urban policy management, and the following question should be asked: what should local authorities precisely do to prioritize place quality when encouraging the elders to be more active and present in public space? The result reveals that the functional quality of place (e.g. safety, aesthetics, amenities, cleanness, comfort, density, and urban landscape) and preferred quality of places like the ability of wayfinding, subjective aesthetic, security, and the control of fear of falling would make the open spaces more likable for the elder.

The second hypothesis is concerned with the effect of the process (environment) on the elderly preferences respectively. This is especially relevant in different contexts with different social environment (social interaction and civic engagement), cultural environments (cultural and Religious beliefs), in addition to the attachment to place and life satisfaction. More importantly, cities like Tehran host different types of old residents who might be attached to urban spaces for different reasons and this then can influence which dimensions of the environment are more important in influencing on being present in public spaces. The findings reveal that the environmental process significantly affected the elders' preferences (path coefficient = 0.5788, $p < 0.01$). Also, social environment positively and significantly affected the desirable place for them (path coefficient = 0.49, $p < 0.01$), sense of belonging (path coefficient = 0.451, $p < 0.01$), cultural environment (path coefficient = 0.362, $p < 0.01$) and life satisfaction (path coefficient = 0.268, $p < 0.01$). Thus, generally, the results on the effect of the environmental process on dimensions of the elders' preferences of urban spaces are supported hypothesis 2.

Discussion

This study shows that several features of public places affect the preferences in the elderly. According to elders' preferences, some features such as density, amenities, safety, aesthetic (environment), urban landscaping, comfort, cleanness, security (crime), security (controlling the fear of falling), security (controlling the fear of getting lost), aesthetic (image), social environment (social interaction and civic engagement), cultural environment (beliefs and attitudes), sense of belonging, and life satisfaction' features constitute the most important design criteria for age-friendly public spaces, which are vital in enhancing their well-being and active aging (Fig. 2).

The process (environment) analysis has revealed that environmental preferences in urban spaces have not been limited only to physical features of that environment; rather, the elders' preference depends on personal experience achieved through a social sense of reciprocity between various social features such as social environment, cultural environment, sense of belonging, and eventually the level of life satisfaction. Among these elements, social environment, sense of belonging to a place, cultural environment and eventually life satisfaction are of highest priority, each informing their perception and preference of urban spaces independently.

Social environment manifests itself in the form of social relations with family members, friends, and closer community, coupled with a sense of trust will form the basis of the reliability of any urban space for the elderly. Considering the input gathered from the participants, a continuous presence in urban spaces will result in a deeper sense of belonging for the elder people. Social isolation has a negative effect on health and increases the mortality rate (13). Thus, providing adequate friendly seating and multifunctional spaces would promote the elders' well-being and sense of self-control through contact and opportunities in making decisions, and realizing personal responsibilities based on stronger social ties. Perceived qualities of outdoor spaces have a moderating role in urban public spaces to maintain the elders' physical functionality and well-being (55–59).

Most of the participants agree that social interaction and the need to talk to one another are their most important life needs. Some elders have spent their lives in old neighborhoods of the urban area and they have already established their own social networks and neighborhood ties together with a sense of belonging. This is unlike new places for them without attachment to place and community where the residents and users are new to the areas and do not have friends who live in the same districts.

The elder people also expressed that social activity is one of the main reasons for their attending public open spaces because they need space to walk and to do other physical activities in a group of friends. For the elders, public spaces like the urban park is a convenient place to meet and catch up with friends, rather than meeting up one another in their small homes. Another reason is social participation in the neighborhood, one of their major social needs is maintaining constant interaction with one another in order to avoid loneliness. The elders have already established strong social interaction among their families, friends and the neighborhood, and they want to maintain its states that long-term residents are more likely to become motivated to accompany with to special public spaces as they mention in interviews. The past experiences of the elders in enjoying public open spaces and a sense of attachment and nostalgia to the past were approved (5).

Provoking memories and a sense of belonging in urban spaces was the other notable element that encouraged the participants to have an informed presence in the research. As one important psychological experience, place attachment (that is, the established emotional ties with a place during the time) adds to older people's stronger inclination to protect the elder against getting lost (way-finding) with their familiar living environment (12).

A significant finding of this research was understanding the determining factor of likeability of urban spaces, manifesting itself as a cultural phenomenon among the elderly people. Special regulations for different genders, presence of pets as well as other norms would affect the elders' sense of comfort and contentment. Personal concerns such as contagious diseases from pets, ideological and cultural beliefs also affected the elders' sense of comfort.

It is vitally important to focus more on the social and cultural needs of the elders in urban spaces, provided that in their views, ideas tastes, and beliefs in this objective is of concern by the authorities. Their social and cultural needs can be met through healthy social participation, they have lived in their

neighborhoods for many years, and anything that may change their everyday lives is of utmost concern must be a major by the planners. The planning of public open spaces should also assure an understanding of the socio-cultural roots of the residents and of the subject communities, which are deeply embedded in their lives as they age in their unique spaces. In general, the concept of rootedness is when one concentrates on cultural heritage (i.e. loss of events, memorials, and local characteristics, etc (5).

The participants noted the desirability of urban spaces as the most notable element. For our participants' urban spaces are only complementary space that would match their private, living spaces, addressing the elements they could not solve in their personal lives. For some city parks are considered as their back yard; hence, their sense of belonging in is even further complemented by attending to and reciprocating with such spaces.

For participants place's function matters the most right after social and non-physical features of urban spaces. Elements such as facilities and metropolitan services are mixed with social sanitary and landscape planning, security, environmental design and eventually safety form the most notable concepts for the elderly people. Based on the findings, the elders complain about the low standards of living and housing in the areas and their homes' qualities can impede them to have enthusiastic to present in the neighborhood' open spaces although the previous studies mostly ignore it.

The elders prefer amenities, services, and public toilets, together with a clean and maintained environment. Their responses indicate a clear emphasis on these features when looking at the general planning, design guidelines and criteria for designing the public places for this group of urban residents as stated previously (5). Accessibility and proximity to other amenities in the area are also important to encourage the older to be present in outdoor spaces. The elders may not be able to access different amenities within a short distance and this makes it difficult for them to walk, especially those who suffer from low mobility. It is found that a walking distance of about 100–200 meter the neighborhood is already quite far and tiring for many elders (60).

According to the former studies, diversity in land use mix, getting lost, proximity to amenities and facilities, and aesthetics are demonstrably associated with higher frequency in being in public spaces. Their findings are consistent with other reports, where residents are more likely to resort to walking if they live in neighborhoods with higher- density housing, easier access to a range of destinations, well-connected street networks with the aesthetic environment and a mix of land-use zones (61).

The notable issue in this study was how security and residential density had insignificant effects on the elders' preference when compared with those of developed countries. In previous studies, the elder people's sense of safety, pleasure, enjoyment, clean air, and noise pollutions and comfort are often affected, and this is linked to their psychological health aspect (5, 58). According to (25), for the elders maximizing the attractiveness or safety of a walking path is more important than minimizing the distance to a destination. Safety is the biggest concern that limits walking for everyday activities and exercise.

This discrepancy becomes understandable in light of high residential density and traffic in urban spaces in Iran's major cities such as Tehran; in other words, these features affect the elders' perception of comfort and security as they automatically prevent any higher rate of commute in cities. Moreover, in Tehran, the elders prefer not to appear in urban spaces due much to the very same reasons, namely, traffic, high residential densities, and pollution.

Eventually, the issue of aesthetics as an element of experiencing places preference had tremendously helped the elders' have a better perception of urban spaces, increasing the likeability of such space while at once improving their perception of urban life. The elders' life experience and perception of urban space depend on various elements such as the fear of falling, security against crime, aesthetics, and abstraction of art as manifested in space and eventually navigation (wayfinding).

The insights on the participants' perception of public spaces characteristics in relation to security for fear of falling, security (crime, way-finding and aesthetic (image) are pointed out in this study. These domains as psychological experiences seem important pathways to a perceived good life in the urban setting, which constitutes the person-environment relation (12). According to the elders' preferences, ordered, spacious and cozy places are contributive in designing public places in their aesthetic sense, which is directly related to the elders' psychological state (12). the social security levels, personal security by emphasizing on fear of falling (62–64), or fear of getting lost (ability to way-finding) (65) are of concern, may discourage walking among elders outdoors. Moreover, high perceived risk of crime has been found to reduce elderly people's incentive to walk through certain areas (57).

In addition to security, which drastically improved the likeability of any space for the elderly people, aesthetics and artistic attractiveness of spaces also contributed to their presence in urban spaces. In addition, this study emphasized the study by Borst et al (2008) on the relationships between built environment characteristics and perceived attractiveness for walking reported by elderly people (57). These qualities are perceived as being attractive to walk along. Conversely, the presence of litter was perceived as unattractive for walking and was also found to be positively related to link resistance (57).

Design implications of age-friendly urban spaces show that such spaces should provide the elders with special socio-cultural restitution in addition to quality-oriented physical features. Providing spaces for socialization, community resorts, places to chat, and places to accompany elders are considered as the essential factors for the elderly people. Large resorts in urban spaces too had appeared in previous literature as a significant feature [14]. Moreover, taking note of old and nostalgic elements in such spaces help them have a deeper sense of belonging. Remembering cultural perspectives such as personal spaces, territories, crowded spaces and the ability to create a peaceful, quiet space is also of high importance in designing age-friendly environments. Socio-cultural features were introduced in previous literature as the founding element in an age-friendly design [6].

In the practical aspect of physical features, providing facilities for the elders such as commercial-recreational spaces in addition to toilets and public transportations will improve the age-friendliness dimension of the design, enhancing the likeability of the space. As Zhai, Y., Li, K., & Liu, J. (2018) claims,

sanitary, the landscape design, security and safety, ease of transportation and commute by way of making proper paths, greenery and providing shades at sunny locations are some of the elements that encourage the presence of elderly people. In addition, low rate of crime, security, eliminating the fear of falling especially by eliminating any form of slope or puddles, proper lighting, smoothness of routes can all improve the likeability of urban space. Improving the quality of security and at once recognizing the essence of ensuring the physical health of the elderly people too will dramatically improve the outcome of the age-friendly design.

Conclusion

The dimensions of the elders' preferences in public space focus on not only personal characteristics but also place (function and preference) and process (social, cultural environment, sense of belonging and life satisfaction) extend the previous findings and offer new insights to the ongoing discussion of age-friendly urban place development.

This study presents the elders' preferences of Iranian urban seniors as an initial feature that are able to launch further theoretical investigations and practical design breakthroughs on age-friendly public space development. Moreover, these findings can only be used as a reference when discussing the global scenario. More research on related topics is needed worldwide for establishing well-defined attributes for suitable designing to better serve the increasing aging population all over the world.

The knowledge presented here is particularly constructive for urban designers and planners to launch further theoretical investigations on age-friendly public spaces from new perspectives to design the age-friendly environments by using guidelines provided in the empirical study as a reference. By doing so, the authorities would assure inclusive city life for all age groups, by stimulating elders' participation in all aspects of planning and governance to maintain their quality of urban places. The important suggestion is the establishment of qualitative measurements that are applicable in identifying the different needs of users of open spaces (e.g., socioeconomic, demographic profiles) and providing more balanced planning and design to meet the current population ratio in an urban setup.

The limitations in this study, consist of its cross-sectional design, the causality of the observed associations which should be cautiously interpreted. The accuracy of questionnaire responses by the elders may be subject to recall bias and inaccuracy, and the self-reported data on subjective measures of the neighborhood environment may contribute to a positive response bias favoring a way-finding association of the self-reported measure.

Declarations

Authors' contributions

All of the authors have made great contributions to research design, field survey, data collection, data analysis, and drafting of the manuscript.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

All participants gave written informed consent. Ethics committee review approval was obtained from Ethics Board of the Iran University of Medical Sciences (IUMS) and all study participants have formally consented to this research.

Consent for publication

All participants gave written informed consent.

Competing interests

The authors declare that they have no competing interests.

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Tables

Table 1- Participants' socio-demographic status who attended the interview.

Feature	Participants (n = 52)	N	Percentage
Age group	65-75	28	54 %
	75-85	24	46%
Gender	Female	27	52%
	Male	25	48%
Education level	Undergraduate	19	35%
	Graduate	20	38%
	Postgraduate	13	27%
General Health perception (self - reported)	Good Health	30	58%
	Moderate Health	14	27%
	Poor Health	8	15%
Socio- economic status	Middle- High	24	46%
	Poor- low	28	54%
Transportation to the park	Around 20 min walk	26	50%
	Around 30 min walk	16	31%
	Other means of transportation	10	19%
Visiting composition	Alone	28	56%
	2 people together	12	24%
	3 people and more	10	10%
Reason for visiting the park	Rest and relaxation	40	20%
	Physical exercise	35	17%
	Enjoy the planting	34	17%
	Leisure and entertainment	32	16%
	Communication with others	32	16%
	Accompany family and friends	18	9%

Table 2- The Main questions and some of the follow-up questions considered during the interviews regarding a special place

Question for the semi-structured interview

- What makes this place special or likable?
 - Why do you like this place?
 - What do you like about this place?
 - What do you dislike about it?
 - What needs to be improved?
 - What potential is there to enhance the place?
-

Table 3- Summary of participants (N = 350) for survey phases of the study

	Variables	N	Percentage
Gender	Male	252	(61 %)
	Female	157	(39 %)
Marital status	Single	17	(4%)
	Widow	91	(22 %)
	Married	302	(74%)
Education	Illiterate Lower of high school	143	(36 %)
	High school	153	(37%)
	Academic	84	(27%)
		26	(8%)
Occupation	Employed	50	(12%)
	Housewife	122	(30%)
	Retired	238	(58 %)

Table 4- Subjective features of the elders' preferences applied in devising the questionnaire

Dimension	Categories	Subcategories	Percentage of interviewees mentioning
Place	Place's function(PF)	Density	72%
		Amenities (access to services)	85%
		Safety (traffic)	92%
		Aesthetics (objective)	68%
		Urban Landscape	65%
		Comfort	80%
		Environmental cleanness	85%
	Place's Preference(PP)	Security (crime)	87%
		Security (fear of falling)	95%
		Security (fear of losing/wayfinding)	85%
		Aesthetics (subjective)	60%
Process	Process Environment(PE)	Social environment	85%
		Cultural environment	80%
		Sense of belonging	75%
		Life satisfaction	750

Table 5- Model specification for analyzing the reliability—factor loadings and reliability indicator.

Elderly Preferences		Factor Loading	AVE
PF	Place	0.88	0.82
	Process	0.88	
	Safety	0.56	
	Aesthetic (environment)	0.59	
	Amenities	0.72	
	Cleanness	0.65	
	Comfort	0.69	
	Density	-0.42	
PE	Urban Landscape	0.60	0.80
	Life Satisfaction	0.41	
	Cultural Environment	0.51	
	Sense of Belongingness	0.71	
	Social Environment	0.77	
PP	Getting Lost	0.47	0.72
	Aesthetic (Image)	0.53	
	Security	0.74	
	Fear of falling	0.79	

Table 6- Fornell-Larcker criterion analysis for checking discriminant validity

	Elderly Preferences	Place	PF	PE	PP
Elderly Preferences	1	0	0	0	0
Place	0.87	1	0	0	0
PF	0.86	0.92	1	0	0
PE	0.88	0.56	0.57	1	0
PP	0.74	0.90	0.69	0.47	1

Table 7- T values of path coefficients of the structural model for PF, PP, and PE

	Path coefficient	t- value	p - value< 0.01 (Supported)
Place -> Elderly Prefrences	0.548	76.1386	.
PF -> Place	0.5761	60.5563	.
PE -> Elderly Prefrences	0.5788	89.0715	.
PP -> Place	0.5037	62.5468	.

Figures

Figure 1

This diagram shows the overall methodology of this research

Figure 2

The hypothetical SEM, standard subject to factor loading