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The impact of local built environment attributes on the elderly sociability

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Abstract

Due to the change of lifestyle and improvement of public health the number of aged people has considerably increased. Considering the relationship of the environment and people, the built environment features could exacerbate or facilitate the elderly people's vulnerability and social needs. Recently, a large number of studies have put emphasis on the relationship between the neighborhoods' open spaces attributes and seniors' social needs. This study seeks to investigate the impact of the built environment indicators on the time the elderly spent in urban spaces of Banafsheh neighborhood in Mashhad. In order to do this, through a cross-sectional survey research, 33 indicators were collected from recent studies and categorized in seven main urban design qualities based on perceived and self-report data collected by questionnaire. A regression analysis revealed the impact of each quality on the sociability of the elderly. Results demonstrate that in this context, "safety" is the most effective factor on the elderly presence in open spaces. "Attractiveness" and "all age presence" are at the next points.

Keywords: *Sociability, The elderly, Local built environment features, Urban design qualities.*

1. Introduction

With changes in life expectancy and population distribution around the world, the number of older adults continues to rise. According to the World Health Organization, today, due to increased life expectancy and health issues, aging has become a global phenomenon and the number of people aged 60 and over as a proportion of the global population will double from 11% in 2006 to 22% by 2050; in the other words, for the first time in human history, there will be more people on earth aged over 60 than children between 0 and 14 [1]. The Iranian population is experiencing similar changes. It is estimated that the elderly population) will increase to about 5.1 million people in 2030 (12.3% of whole population) from 1.6 million people in 2000 (6.4% of whole population [2]. As a result of this growth in the elderly population, urban designers have focused their attention on the needs of this vulnerable group. Along with these trends, determining the social factors that can promote successful aging [3] is of importance.

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The elderly are faced with numerous social role changes that challenge their sense of self and capacity to live happily. Ageing involve physical and mental changes which may impact one's memory, skills and mobility [4].

The organ system declines due to natural aging processes which may make it difficult for them to overcome exposures [5]. One of the main exposure the elderly may face is lack of *sociability*. Sociability is a quality which plays an important role in protecting people from the experience of psychological distress and in enhancing well-being [6]. Georg Simmel defined this concept as the play-form of sociation, that is the pleasurable, joyful and delightful experience that comes out of people`s interaction in society [7]. Sociability can define the informal coming together of people in a place for optional and social activities like meeting, sitting, strolling, eating, hearing and watching people [8].

Sociability leads to the elderly`s expanded social connections, social network, and social energy. The elderly's participation in social spheres has a protective effect against deteriorations in their general abilities, [9] and is essential to this group's developed feelings of satisfaction [10]. Many people experience loneliness and depression in old age, either as a result of disconnecting from the society and neighbors or due to lack of close family ties and reduced connections with their culture of origin, which results in an inability to actively participate in the community activities [11]. In other words, many older adults become socially less active and isolated by emotional and geographical distance from their family members [10]. The importance of being socially active could also be discussed in relation to the effect it has on

mental health. Social relationships are important to seniors and social isolation is potentially damaging [11]. Sociologists have identified low participation in social activities, as a health risk [12]. Previous research has identified a wide range of indicators of social isolation that pose health risks; including living alone, having a small social network, infrequent participation in social activities, and feelings of loneliness [13, 14]. Conversely, research on aging has demonstrated a positive correlation between an individual's ability to age successfully and their social relationships, perceived health, self-efficacy, and socioeconomic status [6].

Sociability, as defined by reducing the elderly's isolation and promoting social capital level make it more likely to offer mutual help and support [15]. This plays an important role in protecting seniors from the experience of psychological distress and therefore in enhancing well-being [6, 16, 1, 17]. Sociability could also be considered in relation to the elderly's physical health [18]. This portion of the population needs regular physical activity, such as walking, to maintain their physical health [19, 20, 21]. Regular and moderate-intensity physical activity reduces the risk of many adverse health outcomes and could maintain or improve the older adults' body balance [22]. Alternatively, physical inactivity is associated with many health-related problems in adults [21]. Sociability by encouraging the elderly to walk to the local public spaces and promoting physical activity in such locations (as compared to an isolated life style,) has a positive effect on these individuals' physical health [20, 3]. In sum, where social capital is composed of social cohesion, social trust, social participation [23, 24, 25] and social support [5] it is supposed that sociability as achieved by enhancing the elderly's social capital and physical activity (Fig. 1) improves the mental and physical health [25, 5, 6, 23, 26, 27].

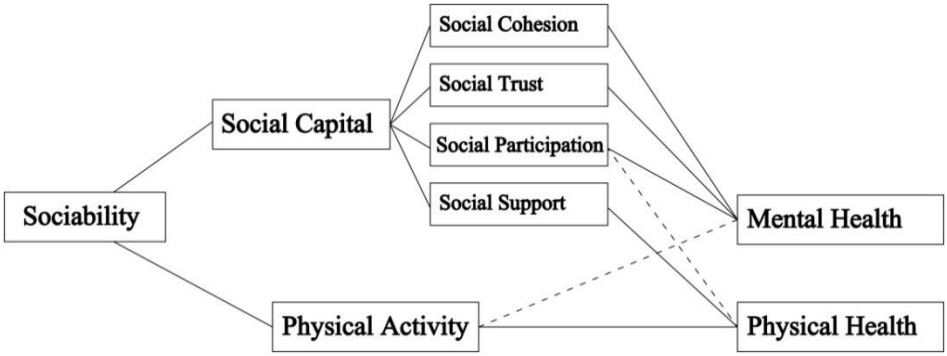

Fig. 1. The indirect effect of the elderly sociability on the health (Source: Authors)

2. Conceptual Framework

The conceptual framework of this study is based on the role of perceptions in the mediation between the built environment features and sociability after Ewing and handy [28]. Hence, this study's approach is to link specific physical features to urban design qualities using factorial analysis (Fig. 2).

For practical reasons and to make the urban design qualities applicable to the ultimate task at hand, the urban design qualities should be extracted from the built environment features. (see Fig. 2).

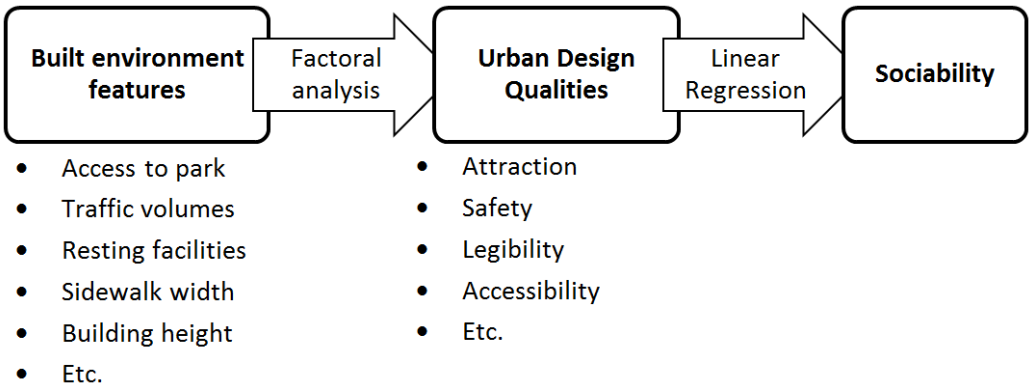

Fig. 2. Study's conceptual framework

2.1. Built environment attributes and the elderly sociability

The health and well-being of older adults is affected by their level of sociability [6, 29]. Seniors have more time to spend in open spaces near their residence, as well as a heightened disposition to meet other people while outdoors [29, 16]. Nonetheless, some local built environment attributes may limit their ability to reach appropriate levels of sociability. Previous research shows the impact of neighborhood character on the elderly's level of sociability and mental health [21, 19].

According to Williams [30], the sociability between people in communities is affected by three main elements: social factors (e.g. social structure, social trends, etc.), social class (education, job, income, etc.) and environmental factors (density, division of space, communal space, etc.); the latter of which is subject to further investigation in this paper. For older people, environmental factors are highly influential [21, 20]. Ageing is associated with an intensification of sensitivity by locality [5] and older people's daily social life may contribute significantly to neighborhood features [29]. Several conditions often experienced by elders, such as the lost ability to drive as a result of certain disabilities [5], in addition to far distances to public transportation stations, make the elderly fundamentally dependent on and significantly affected by the attributes of their local built environments. The built environment may exacerbate these vulnerabilities by creating additional barriers to their accessibility and maintenance in local urban spaces and public places [5]. Alternatively, the built environment can facilitate the elderly's social interactions with their neighbors and their social life within the local community. For example, walking among the senior citizens could be encouraged through the presence of local services, traffic and pedestrian infrastructure, neighborhood attractiveness, public transport, pavements, buffer zones between pedestrians and road traffic with presence of vegetation and greenery (e.g. trees, shrubs, gardens) and low level of neighborhood crime [21, 31, 32]. Previous studies show that the frequency of leisure-time physical activity is strongly affected by continuity of neighborhood paths [33], distance to the parks, comfort and attraction [34] and street intersection density (connectivity) [35]. Due to the relative lack of ability of movement among the elderly, these factors are more determinant for them. Finally, as "what attracts people most is the others" [36], the effect of socio-environmental variables of neighborhood, such as population density, should also be taken into consideration in regards to seniors' sociability [31, 37]. The elders' sociability is also dependent on special design solutions, such as legibility, navigation and direction, as well as understanding the environment [38]. Community level factors such as neighborhood accessibility, safety and aesthetics of the environment may also impact likelihood that an elderly individual will regularly leave their home [31].

2.2. Indicators of urban design domain of the elderly sociability

Effective built environment features (indicators) and qualities (factors) on sociability are introduced. Booysen [39] asserts that indicators can be classified and evaluated according to a number of general dimensions of measurements. He further claims that the selection of indicators should be ''generally based on theory, empirical analysis, pragmatism or intuitive appeal, or some combination thereof''. There are also some [40] who believe that the central consideration in selection of indicators should be based on the purpose of the measurement. Therefore, to select the appropriate indicators to reflect the urban design domain of the elderly sociability, related literature, including theories and empirical studies were reviewed. Local conditions and characteristics were also taken into consideration. On this basis, 33 indicators were selected (Table 1). These indicators were used to measure the impact of the built environment variables on the elderly sociability in the Banafsheh Neighborhood of Mashhad metropolis. This data was collected through a questionnaire, the details of which are given in the "data collection" section.

Table 1 Selected indicators to measure urban design domain of the elderly sociability

	Indicator	Study
1	Navigation	[41], [27] ,[42] ,[7], [1], [17]
2	Visual Distinction	[41], [43], [7], [44], [45]
3	Ceremonies and Rituals	[46], [47], [44] ,[7], [48], [38], [49]
4	Sports and Entertainment	[32], [47], [15], [50], [29], [49], [51], [52], [53], [54]
5	Bumpy Sidewalk	[38], [29], [21], [27], [55], [47]
6	Sidewalk Discontinuity with Roads	[49], [46], [21]
7	Barriers in Sidewalk	[49], [47], [29], [21], [55], [10], [38]
8	All ages inclusiveness	[56], [49], [57], [29], [27]
9	Daily activity (Diversity)	[49], [27], [7], [32]
10	Open space (Diversity) Building (Attractive)	[49], [32] ,[16], [38], [29], [45], [27], [58], [21], [47], [31]
11	Appropriate Context for walking and sporting	[20], [49], [31], [47]
12	Recreational Program from municipality	[55], [57], [58], [20], [50]
13	Access to retails	[47], [27], [55], [31], [32], [50]
14	Access to shopping centers	[41], [27], [32], [49], [50], [47]
15	Sidewalk width	[38], [49], [32]
16	Existence of Other people	[29], [32], [48], [57], [31]
17	Land Use Mix	[32], [27], [56] ,[42], [47], [31], [49], [29] , [38]

18	Access to Park and Walking Paths	[49], [27], [42], [47], [54], [29], [55]
19	Access to Public Building	[51], [32], [56], [43], [16], [50], [55]
20	Access to Public Transportation	[49], [51], [47], [32] ,[42], [16], [29], [56],
21	Access to Administrative Building	[32], [27], [55]
22	Attractiveness and Beauty	[21], [58], [32], [47], [29], [27], [7], [50]
23	Familiarity with Places	[49], [27], [58]
24	Criminal, thief and Addicted	[47], [31], [49], [32], [20], [50]
25	Fear of Crash with Automobile	[41], [20] ,[29], [32]
26	Darkness of Paths in the Night	[48], [38], [49], [47], [29], [32],
27	Resting Facilities	[49], [56], [59], [48], [1], [29], [38], [27], [17]
28	Drinker and Trash	[38], [49], [29], [27]
29	Plenty of Neighborhood Places	[49], [47], [59], [29], [50]
30	Displacement of Furniture	[29], [27], [38] , [47], [50]
31	Boringness of Neighborhood	[29], [49], [48], [31], [32]
32	Greenness	[27], [49], [1] , [29], [21], [50], [38]
33	Maintenance	[49], [1], [50], [38], [47]

3. Methodology

3.1. Case and sample selection

This study was conducted on Banafsheh neighborhood in Mashhad metropolis (Fig. 1 and 2). The population of Banafsheh was 5533 in 2006 [60] and by using a growth rate of +1.8 [61] this population is estimated to have reached 9959 people in 2014.

The randomly selected samples in the area were composed of the elderly, aged 60 and more (Mean 46% women (189) and 55% men (226)). The sample size totaled 411 participants (the minimum required, according to the Cochran formula, with a confidence interval = 95%, p = q = 0.05, d = 0.05, is 380).

The study poulation is relatively homogenius in education and income level (Tabel 2). Based on the July 12, 2011 Census Data of Iran Statistical Center, residents in the study area, in comparision to the other zones, are of high-income class and highly educated [60]. The descriptive statistics of residents' job status is provided in Table 3.

Fig. 3. Mashhad and study area

Fig. 3. The study area land uses

Table 2 Descriptive statistics of residents' job, income and education categories

	Frequency	Percent
Job status		
Employed	110	26,76
Retired	214	52,07
Unemployed	87	21,17
Income level (per month)		
Less than 333$	93	22,63
Between 333 and 666$	209	50,85
More than 666$	109	26,52
Education		
Illiterate	10	2,43
Under Diploma	46	11,19
Diploma (4-year high school)	104	25,30
2-year college	177	43,07
Bachelor	54	13,14
Master	14	3,41
PhD	6	1,46

In spite of homogeneity in socio-economic factors, the local built-environment characteristics varies in different parts of the neighbourhood based on both of routs and urban open spaces.

3.2. Data collection

This study, like the growing body of research supporting the relationship between built environment features and elderly sociability [31, 62, 63] is based on self-report data. Data collection was performed during daylight hours (8:30 am to 16:00 pm) through interviews by the authors. The following two main data categories were collected:

- The amount of time the elderly spend in neighbourhood open spaces with their friends
- Built-environment variables

The former was assessed through a cross-sectional survey, using a questionnaire to collect data on the time residents normally are engaged in the use of the open space for different purposes. To collect the required data for measuring the features of the built environment, three methods are suggested: [63] (a) perceived measurement [64, 65] (b) auditing [66] , and (c) objective analysis using GIS [67]. For the purposes of this study, due to the importance of the elderly perception of the built environment, the first method-perceived measurement-was used.

3.3. Data transformation

Data obtained through the household interviews were entered into a microcomputer and then analyzed by using SPSS (version 16). Because of senescence of the

interviewees, the selected indicators for the study purposes (Table 1) were transformed only into a 1–2 score based on their merit and contribution towards urban design domain of sociability (Table 4).

Table 3 Scaling of indicators of urban design domain of walkability

Responses	Scores
Agree	1
Disagree	2

3.4. Factor Analysis

Factor analysis is a multivariate analytical technique used to uncover the latent structure of a set of variables. It is used to derive a subset of uncorrelated variables called factors that explain the variance observed in the original dataset [40]. Factor analysis is usually performed to establish a pattern of variation among variables or reduce large data sets into factors for easy handling and interpretation [68].The total number of factors generated indicates the total number of possible sources of variation in the original dataset.

4. Results and Discussions

4.1. Deriving effective urban design qualities on walkability

Factor analysis was run for the 33 selected indicators, using SPSS software. To test the overall sampling adequacy for the application of a factorial analysis, Bartlett's Sphere Test and the Kaiser–Meyer–Olkin (KMO) were used [37]. The Bartlett's Sphere Test (sig.= 0.000) and KMO value of 0.606 indicate the suitability of the factorial analysis performed.

Table 4 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.606
Bartlett's Test of Sphericity	Approx. Chi-Square	620.884
	df	276
	Sig.	0.000

To determine the total number of factors to be extracted for the dataset in this analysis, the Kaiser criterion [69] was applied. Under this criterion, the only factors with eigenvalues greater than or equal to 1 are accepted as possible sources of variance in the data, with the highest priority ascribed to the factor that has the highest eigenvector sum [40]. When the factor analysis was done, using Varimax rotation and applying this criterion, it yielded a clear factor structure with seven factors that explained 61.80% of the total variance (Table 5). The communality, which is the sum of the square of the factor loadings for each variable, indicates the proportion of the variance for each variable accounted for by the seven factors. A look at the communalities (Table 5) indicates that the extracted eight factors strongly reflect the urban design domain of the sociability.

Table 5 Total Variance Explained and factor loading matrix for the urban design sub-domain of Sociability

	Indicators	F1	F2	F3	F4	F5	F6	F7	Communalities
1	Ceremonies and rituals	**0.91**	0.10	-0.05	0.09	-0.07	0.07	0.02	0.831
2	Land use mix	**0.84**	-0.09	0.01	-0.06	-0.01	-0.11	0.03	0.720
3	Municipality recreational programs	**0.84**	-0.05	-0.10	-0.03	0.09	0.04	0.05	0.702
4	Access to public transportation	-0.13	**0.70**	-0.07	0.34	-0.29	-0.03	-0.12	0.677
5	Access to shopping centers	-0.15	**0.69**	0.15	0.17	0.16	0.07	-0.14	0.549
6	Sidewalk discontinuity with roads	0.14	**-0.66**	0.11	-0.13	-0.24		-0.28	0.660
7	Urban spaces maintenance	0.07	**0.60**	0.19	-0.11	0.32	-0.06	0.17	0.598
8	Barriers in sidewalk	-0.17	**-0.60**	0.10	0.04	-0.13	-0.07	-0.03	0.468
9	Access to retails	0.20	**0.53**	-0.01	-0.26	0.18	0.06	-0.01	0.582
10	Access to public building	-0.05	**0.51**	-0.07	-0.16	0.00	-0.16	-0.06	0.708
11	Access to administrative building	0.10	**0.48**	0.02	0.26	0.05	0.03	0.07	0.512
12	Plenty of neighborhood places	-0.31	-0.04	**0.88**	-0.06	0.08	0.02	0.08	0.720
13	Diversity of activities	0.20	0.17	**0.69**	0.29	-0.08	0.05	0.08	0.750
14	Visually attractiveness and beauty	0.24	0.04	**0.61**	0.09	-0.10	-0.06	-0.24	0.621
15	Appropriate context for walking and sport	0.00	0.19	0.06	**0.67**	-0.09	-0.17	0.06	0.485
16	Plenty of physical activities and sports	-0.01	0.03	0.06	**0.66**	0.14	0.19	-0.22	0.527
17	Access to park and walking paths	0.00	-0.27	0.05	**0.40**	0.32	-0.06	0.17	0.595
18	Greenness	-0.03	0.05	0.10	-0.07	**0.77**	-0.03	-0.13	0.591
19	Resting facilities	-0.06	-0.14	0.29	-0.21	**0.64**	0.12	0.21	0.537
20	Sidewalk width	0.07	-0.05	0.17	-0.15	-0.15	**0.67**	0.03	0.567
21	Different levels of sidewalk	0.05	0.16	0.25	0.05	0.09	**-0.64**	-0.13	0.561
22	Fear of injury due to slipping	-0.07	0.06	0.12	0.08	-0.16	**-0.59**	-0.23	0.532
23	Fear of automobile accident	0.09	0.12	0.14	-0.09	0.31	**-0.54**	-0.23	0.490
24	Existence of other people	0.08	-0.17	-0.10	0.35	-0.18	**0.52**	-0.02	0.523
25	Crime, thief and drug usage	0.06	-0.09	0.04	0.22	0.10	**-0.50**	0.20	0.642
26	All ages usage of urban spaces	0.07	0.01	0.02	-0.09	-0.24	0.08	**0.92**	0.775
	Eigenvalues	**3.10**	**2.66**	**2.05**	**1.72**	**1.36**	**1.26**	**1.16**	
	% Explained variance	13.84	11.98	9.45	8.07	6.59	6.16	5.72	
	% Total explained variance	**61.81**							

Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization and rotation converged in 9 iterations.

Factor one (f1) accounted for 13.84 % of the data set's common variance and represented dimension with high loadings by ceremonies and rituals (0.91), land use mix (0.84), and municipality recreational program (0.84). These features are hereby called "human activities".

Factor two (f2) accounted for 11.98 % of the data set's common variance and represented dimension with high loadings by access to public transportation (0.70), access to shopping centers (0.69), sidewalk discontinuity with roads (-0.66), urban spaces maintenance (0.60), barriers in sidewalks (-0.60), access to retails (0.53), access to public building (0.51) and access to administrative building (0.48). These features, in turn, are named under "accessibility".

Factor three (f3) accounted for 9.45% of the data set's common variance and represented dimension with high loadings by plenty of neighborhood places (0.88), diversity of activities (0.69), and visually attractiveness and beauty (0.61). These features are named "diversity and attractiveness".

Factor four (f4) accounted for 8.07% of the data set's common variance and represented dimension with high loadings by appropriate context for walking and sport (0.67), plenty of physical activities (0.66) and access to park and walking paths (0.40). These features are named "sport facilitating".

Factor five (f5) accounted for 6.59% of the data set's common variance and represented dimension with high loadings by greenness (0.77) and resting facilities (0.64). These indicators are classified under "comfort".

Factor six (f6) accounted for 6.16% of the data set's common variance and represented dimension with high loadings by sidewalk width (0.67), Different levels of sidewalk (-0.64), Fear of injury due to slipping (-0.59), Fear of automobile accident (-0.54), existence of other people (0.52) and crime, thief and addiction and drug usage (-0.50). This factor is called "safety".

Factor seven (f7) accounted for 5.72% of the data set's common variance and represented dimension with high loadings by all ages inclusiveness (0.92). This feature is named "all age presence".

4.2. Effective urban design qualities on the elderly sociability

To investigate the impact of urban design qualities (derived factors) on walkability, linear multivariate regression between factors and the elderly sociability was performed. Stepwise Multivariate linear regression (Table 6 and 7), between the elderly total time spent in urban space and derived factors (urban design qualities), reveals significant correlation (R Square=0.146 and Sig.= 0.010). It shows that the influential factors on the elderly sociability walking are "safety" (Beta=0.2 and Sig.=0.032), "attractiveness" (Beta= 1.736 and Sig.= 0.046) and "inclusiveness" (Beta= 0.167 and Sig.= 0.050).

Table 6 Selected Model Summary and ANOVA [b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	df	Mean Square	F	Sig.
6	0.436[a]	0.146	0.122	9.54900	3	367.767	4.033	0.010[a]

a. Predictors: (Constant), All age presence, Diversity and Attractiveness, Safety
b. Dependent Variable: Time Spent in Urban Spaces

Table 7 Coefficients [a] (dependent variable: time spent in urban spaces)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	17.030	0.955		17.834	0.000
Diversity and Attractiveness	1.673	0.964	0.168	1.736	0.046
Safety	1.996	0.970	0.200	2.058	0.032
All age presence	1.668	0.967	0.167	1.726	0.050

Safety

According to Oscar Newman [70] *safety* encompasses ideas about crime prevention and neighborhood safety shows the relation between community design, public health and social control on space. Also, in inclusive design *safety* refers to the extent to which spaces enable people to use, enjoy and move around the outside environment without fear if tripping or falling, being run-over or being attacked [27]. Many articles have defined safety as an important factor for people`s presence in open spaces. This is more determinant for the elderly because the older years are a particularly vulnerable time, physically and psychologically [29, 42, 43, 48, 65, 31]. For example, failing eyesight and reduced physical strength caused many older people to feel vulnerable [41]. In this situation, safety plays a crucial role in age-friendly outdoor spaces checklists. Public safety in all open spaces is a priority and is promoted by contributors such as, good street lighting, police patrols [59], crime and thief safety [31, 47, 32]. Social and environmental aspects of age-friendly community policies, programs, services and infrastructure must to be designed in such a manner to enable older people to live in security, enjoy good health and continue to participate in society in a safe situation [1, 20, 17].

Diversity and Attractiveness

Neighbourhood public places are expected to be living spaces, linked to the presence of people and their activities .Their sheer presence and variety provide people with a range of different spaces to choose from; each based on the individuals' personality, social class, taste and mood. Neighbourhoods with few or monotonous

urban spaces can only attract one specific group. Hence, the attractiveness and beauty of the space have become central factors in recent research [58, 32, 47, 71, 29, 21]. The presence of bars, restaurants, other catering establishment, shops, public services, businesses [29], as well as diversity in activities available in the urban spaces make these places more attractive to for social purposes [41, 27, 7, 72]. Diversity of street characteristics especially ones that apply to walking, the local street environment, parks and urban furniture are also positively associated with attractiveness [21]; whereas the presence of litter and vacant buildings are negatively related to attractiveness [21, 33].

All age presence

According to Elizabeth Burton & Lynne Mitchell [28], *inclusiveness* means designing products, services and environments for all people [29], regardless of age or ability. Inclusiveness has grown out of two major trends: the aging of the population and desire to bring disabled people into mainstream society [27]. Also, age-friendly checklist adapts the structures and services to be accessible to and inclusive of older people with varying needs and capacities [59] that can help them to promote their personal well-being, social cohesion and enjoyment for all in different spaces [57]. Although disabled and vulnerable people are not homogenous, considering their needs within the design process will be beneficial for everyone [57].

5. Conclusion

Neighborhoods and its built environment features are associated with the elderly`s quality of daily life. This population's health outcomes are also greatly shaped by complex interactions between individuals and their environments [26].

One of these qualities is *sociability* which is related to physical, social and psychological well-being. Although, many recent studies in developed countries have focused on this subject, it has largely been neglected in developing countries. This study's results show that built-environment factors have an effect on the elderly's sociability.

For the purposes of this paper, a literature review was conducted on the elderly sociability-related urban design features. Data on urban design features were collected on the basis of perceived measurement and data on the time spent in urban spaces was collected through interviews. In order to eliminate the multicollinearity of variables, the large data set of variables (features) were reduced into eight factors (urban design qualities). Multivariate linear regression between the time the elderly spent in urban spaces with their friends and derived factors, shows that the qualities of "safety", "attractiveness" and "inclusiveness" respectively are the most influential factors on this group's sociability. The results also determined that fear of injury is the most limiting factor in using urban spaces for the elderly. This fear is derived from a possibility of being exposed to crime, theft and drug use (-0.50) and is exacerbated in the absence of "eyes on the street" (0.52) and facilitated by narrow sidewalks (0. 67), particularly due to threats of theft with the use of motorcycles. The fear of injury could be also physically. Inappropriate width of sidewalks (0.67), slipping (-0.59), uneven surfaces (-0.64) could increase the probability of physical injury among the elderly. Fear of automobile accidents (-0.54) is also in this category. The next determining factor for the amount of time the elderly use the neighborhood urban spaces is diversity and attractiveness of urban spaces. According to the results of this research, an increase in the variety of activities available in a given space contributes to the attractiveness of that space. This study also shortly indicates the possible effect of the amount of time spent in urban spaces on social capital and the effect of different social capital sub-domains on health domain scales, especially with respect to mental health (see Fig. 1). Further research in this area is recommended.

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