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Developing an age-friendly mosques' structure assessment tool

Zahra Mohammadi [1], Aram Tirgar [2], Shima Sum [3], Samaneh Pourhadi [4]✉ *

1. M.Sc. in gerontology, Student Research Committee, Babol University of Medical Sciences, Babol, Mazandaran, Iran.
2. Mobility Impairment Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, I.R.Iran
3. Ph.D. of Gerontology, Social Determinants of Health (SDH) Research Centre, Babol University of Medical Sciences, Babol, Mazandaran, Iran.
4. Ph.D. of Gerontology, Social Determinants of Health (SDH) Research Centre, Babol University of Medical Sciences, Babol, Mazandaran, Iran.

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ABSTRACT

Background: Many studies have proved the positive impact of public environment proportion on the quality of life of the elderly people. One of the environments that have appropriate effects for the elderly is religious places such as mosques. Therefore, the aim of this study is to develop a tool for structural fitness of age-friendly mosques, in a way that factors affecting the mosques to be age-friendly can be recognized through preparation of a standard checklist.

Methods: The components of the tool were developed through reviewing scientific literatures and sites. Measuring methods of face and content validity were used to investigate the validity of the research. The content validity was explored by employing a panel of 12 experts, including 4 individuals with PhDs in Gerontology, 4 Ergonomists, and 4 experts with PhD or Master's degree in Civil Engineering. For the face validity, 20 individuals were surveyed, who were expected to complete the checklist when the project was operationalized. Cronbach's alpha coefficient was used to determine the reliability.

Results: The primary tool included 145 items in 12 domains, which were reduced to 121 items in 10 domains within the group discussion. Following the investigation of validity and reliability of the research, the number of final items of the tool was gathered in 80 questions. The mean of content validity index of the tool was calculated 0.96, Content validity Ration was greater than 0.56, and the Cronbach's alpha coefficient was 0.875.

Conclusion: The assessment tool of age-friendly mosques is available with appropriate validity and reliability to evaluate structural barriers in public places, including mosques. By studying the assessment tool, it is anticipated that the problems of access to the elderly in the mosque and other spaces would be identified and accessibility would be encouraged in the society.

Keywords: Elderly, Age-friendly city, Reproducibility, Tool, Mosque.

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*** Corresponding Author:** Dr Samaneh Pourhadi
Address: Ph.D. of Gerontology, Social Determinants of Health (SDH) Research Centre, Babol University of Medical Sciences, Babol, Mazandaran, Iran.
Tel: +98 911 1137787 **E-mail:** samaneh.pourhadi@gmail.com

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Introduction

It is essential to make the public places accessible for all age groups especially the elderly. Looking at the rapid growth of the elderly population, the importance of planning and design of age-friendly and Activity-friendly environments is clear (1,2). For instance, the percentage of elderly population in the early twentieth century was 4%, which is predicted that it will reach 22% by 2050. It means that from every five individuals, one will be elderly (3). In 2017 in Iran, more than 10% were over 60 years old, which it will increase to 30% by 2050 (4,5).

At present, Iranian society, as a developing country, has a young population, which in the coming years; this number will be transferred to the upper part of the population pyramid (6). Therefore, it is better to talk more about issues related to the aging of the population. Among these the issue of health, well-being and ensuring their comfort and well-being in society, is gaining new and wider dimensions every day (7).

In the field of comfort and well-being of the elderly, providing a friendly environment for the elderly is a valuable strategy. Removing environmental barriers will lead to greater participation of people in social activities and a higher level of activity for the elderly (8). The World Health Organization also introduces eight indicators as criteria for the aged-friendly city. These indicators are: indicators of urban open spaces, buildings and public and religious places, transportation, safety and ease of traffic, social respect, social participation, health and therapy, cultural and recreational (9).

In our country, research has been conducted in the field of elderly-friendly cities with the aim of recognizing patterns and features of elderly-centered urban design. According to the study of Nabavi et al. (2015), there was a significant relationship between falls with inappropriate ergonomic conditions such as the condition of stairs and railings, toilets, lack of light and slippery floors (10). Garment et al. (2013) also mentioned the cause of falls in the elderly as ignoring the principles of environmental safety (11). Jafarian et al. (2013) also investigated the fall in houses and its related factors in the city of Babel and designed a questionnaire in this regard (12). In the research of Mazloumi et al. (2019) it is stated that designing the environment and tools in accordance with the limitations of the elderly is an important factor in improving the quality of life of the elderly. In this study, the design and validation of the list of ergonomic risk factors in nursing homes and the list of functional ability of the elderly has been done and the need for adaptation has been emphasized (13).

Adjustment of urban spaces, buildings and public and religious places, transportation and traffic despite the limitations of old age is something that is better to start from environments in which the elderly are more present and need more to ensure, maintain and improve their health(14-17).

One of the environments for the elderly that has positive and constructive effects on physical, mental, social and spiritual health and is also associated with appropriate effects throughout life and the prevention of premature aging, is the religious places that are mosques for Muslims (18); As in Iran, the highest social participation of the elderly is attending mosques (19). Religious sites help maintain the dignity and worth of the elderly, fill leisure time and a sense of belonging in the elderly (20). Due to the lack of tools to study the ergonomics of mosques with suitable conditions for the presence of the elderly, this research was conducted with the aim of developing a tool for structural fitness of age-friendly mosques .On the other hand, the research team hopes to raise the level of awareness in the field of place adjustment by identifying and introducing some structural features.

Methods

This study is a kind of construction and validation (tool making) that was conducted through secondary studies of Iranian and foreign papers, the concepts of age-friendly public places in the city such as church and mosque were investigated and the indices related to the current standards in Iran were discussed. A checklist comprising 145 items in 12 domains was prepared. Due to the group

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discussions with the research team, and overlapping and thematic similarity, the domains were reduced, deleted or merged into 121 items in 10 domains. To evaluate the content and face validity of the tool, the qualitative method was used. For the content validity part, 12 experts were invited to comment including 4 experts in the field of Gerontology, 4 architects and civil engineers, and 4 ergonomists. During this phase, experts were asked to comment while considering three options for the questions: 1-necessary 2-useful, but not necessary, 3-not necessary. If required, they could present their own proposals. Afterwards, the content validity ratio was calculated based on the following formula:

$$CVR = \frac{ne - \frac{n}{2}}{\frac{n}{2}}$$

ne refers to the number of experts who have chosen the necessary option and *n* shows the total number of experts who participated in the survey. The ratios obtained for each item were compared with the numbers provided by Lawshe (Table 1), and if the number obtained from the table was greater than 0.56, then the content validity of the item was verified. The rest of the questions that did not get the required score were deleted. 30% to 70% of the questions are usually removed at this stage (21).

Table 1.The minimum value of CVR in terms of the number of experts and the level of significance

Number of experts	CVR value	Number of experts	CVR value	Number of experts	CVR value
5	0.99	**11**	0.59	**25**	0.37
6	0.99	**12**	0.56	**30**	0.33
7	0.99	**13**	0.54	**35**	0.31
8	0.75	**14**	0.51	**40**	0.29
9	0.78	**15**	0.49		
10	0.62	**20**	0.42		

To examine the content validity index, Waltz and Bausell method was used. Experts categorize “relevance” of each question based on a 4-point Likert scale. They consider 1 as “not relevant”, 2 as “somewhat relevant”, 3 as “relevant, but needs to be reviewed”, and 4 as “very relevant.” In the following formula, the numerator indicates the number of experts who selected the options three or four, and *n* shows the total number of experts who participated in the survey.

$$CVI = \frac{ne(3or4)}{n}$$

The minimum value of the CVI index, which can be acceptable, is 0.79. If the CVI index of the question is less than 0.79, then that question should be deleted. In other words, at least 10 out of 12 experts should choose "very relevant" or "relevant, but needs to be reviewed" (14).

For the face validity, 20 individuals including professional health experts, environmental health experts, health care workers, master students of health of the elderly, and mosque curator were employed to comment. Their comments are used to examine the apparent features of the tool. In order to evaluate the impact scores, participants are initially asked to rate the importance of each question in the questionnaire based on a five-point Likert scale, in which 1 is “not important at all”, 2 is “ slightly important”, 3 is “partially important”, 4 is “important”, and 5 is “highly important”. Then the impact scores are calculated using the following formula:

Impact score = Importance × Frequency (in percent)

To accept the face validity of each question, its impact score should not be less than 1.5 and only questions with the score above 1.5 are acceptable (14). After calculating the CVR and CVI indices and the impact score, a tool consisting of 80 questions and 10 domains was acquired. Reliability of the tool was determined using SPSS software version 22 and the Cronbach's alpha 0.875.

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Ethics approval

This study has done after obtaining the license of MUBABOL.HRI.REC53 / 139. The consent of the participants and the possibility of leaving the study were considered. The results were kept in a proper place that only the research team had the access permission. Information was used only for the research objectives and its confidentiality was maintained.

Results

The primary tool of this study included 145 questions in 12 domains. However, given the discussion of the research team, it reduced to 121 questions in 10 domains. The domains contain the status of the road with 18 questions, the main entry to the building with 8 questions, the status of drops, stairs, and ramps with 28 questions, the status of toilets with 22 questions, doors with 5 questions, corridors and internal paths with 10 questions, the status of elevator with 10 questions, the status of special chairs for prayer with 7 questions, the status of amenities with 7 questions, and finally the safety status of mosque with 6 questions. Regarding the content validity ratio, the number of questions whose content validity rate was higher than 0.56 was 81, and 40 questions were not scored and eliminated. For the qualitative part of the content validity, three questions were promoted considering the suggestion by the experts. Based on the findings, the number of questions with a score above 0.79 was 116, and five questions whose content validity index was less than 0.79 were excluded from the tool. The mean of content validity index for the final tool was obtained 0.96. Regarding the face validity of the tool, given the impact score, no question was removed at this stage due to the absence of face validity and all of them gained the impact score above 1.5. The mean of impact score was calculated 4.58 with a maximum of 4.9 and a minimum of 4.15. In the qualitative part of the face validity, which was asking about clarity, two questions were merged and eight questions were corrected. According to the findings of this study, 81 questions acquired both scores of the content validity ratio and the content validity index. The final tool that is illustrated in Table 2 embraces 80 questions. To calculate the reliability of the tool, the internal consistency method and the Cronbach's alpha coefficient were used in a way that the tool was completed in 10 mosques by two evaluators and the Cronbach's alpha was attained 0.875.

Accordingly, the contribution of each domain in the tool above is mentioned in Table 3. Ultimately, for the reliability of the tool, internal consistency coefficient and Cronbach's alpha coefficient were employed, in the way that the structural fitness tool for the age-friendly mosques in 10 mosques in the city of Sabzevar was completed by two evaluators. It is worth mentioning that the contingency coefficient between the two testers was equal to 82.12 and the Cronbach's alpha was calculated 0.875 using SPSS version 22.

Table 2. Questions of the final tool

Dimensions of the structural fitness	Question (yes, somehow, no)	Validity		
		Content validity		Face validity
		CVR	CVI	
A: Evaluating the road	1. Is the mosque located within the right distance of the public transportation network?	0.83	0.83	4.7
	2- Is the width of the sidewalk at least 1.2 m?	0.66	0.83	4.8
	3. Is the movement of people perfectly smooth?	0.83	1	4.8
	4. Is there enough lighting at the level of roads? (roughly 100 lx)	1	1	4.85
	5. Is there a pedestrian crossing in front of the mosque?	1	1	4.4
	6. Is there a bridge leveled with the sidewalk over the street gutter?	0.83	1	4.75
	7. Is the bridge solid, so that it does not allow the crutches or heels of the shoes to be entangled?	0.66	1	4.9

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Dimensions of the structural fitness	Question (yes, somehow, no)	Validity		
		Content validity		Face validity
		CVR	CVI	
B: Evaluating the main entry to the building	8. Is there a proper space (at least 150 cm) for wheelchairs on both sides of the entrance?	0.83	1	4.65
	9. Is the drop of the entries a maximum of 2 cm?	0.66	1	4.45
	10. Have the necessary signs for guiding the elderly been installed in a clear way?	0.66	0.91	4.55
C: Evaluating the status of drops, stairs, and ramps	11. If there is a staircase, is there a landing between every 12 steps?	1	1	4.7
	12. Is the tread of the step equal to or greater than 33 cm?	0.83	1	4.8
	13. Is the riser of the step equal to or less than 17 cm?	0.83	1	4.8
	14. Is the width of the step equal to or greater than 110 cm?	1	1	4.75
	15. Are there any conditions around the stairs preventing damage to the head?	0.83	1	4.7
	16. Is the edge of the steps intact and without fracture?	0.66	0.91	4.75
	17. Is there a guarding in places with the height of more than three steps, in which falling may occur?	1	1	4.7
	18. Is the height of the guarding at least 110 cm?	0.66	1	4.3
	19. Do the stairs have touchable warning signs (at the beginning and at the end of the step), especially for visually-impaired people?	1	0.91	4.45
	20. Is there a ramp (with proper slope) for moving wheelchairs?	1	1	4.65
	21. Is there a suitable handrail at a height of 85 to 95 cm on either side of the ramp?	0.66	1	4.7
	22. Is the handrail made of solid and heat-resistant materials?	0.66	1	4.25
	23. Is the width of the ramp for moving the wheelchair a minimum of 120 cm?	0.66	1	4.7
	24. Is the slope or angle of the ramp (maximum 8%) suitable for moving the wheelchair?	0.83	1	4.6
	25. Is a portable or mobile lift available if there is no fixed ramp?	0.83	1	4.45
	26. Is there a proper path for wheelchairs in all parts of the mosque, including the toilets?	0.83	1	4.6
D: Evaluating the toilets	27. Is there at least one flush toilet with accessible path in the mosque for people with disabilities?	1	1	4.9
	28. Are the switches easily accessible while standing or sitting? (75 cm high)	0.83	1	4.35
	29. Does the toilet door have a handle and a lock, which is easy to open and close?	0.66	0.91	4.35
	30. Are the door handles easily accessible while standing or sitting? (approximately 75 cm high)	0.83	1	4.3
	31. Is the width of the door appropriate for wheelchairs? (at least 80 cm)	0.83	1	4.8
	32. Is the interior space of the toilet large enough? (170 x 150 cm)	1	0.91	4.55
	33- Is the height of the flush toilet suitable from the floor level? (38 to 45 cm)	0.83	0.91	4.6
	34. Is there a valve that can be easily opened with hand or elbow?	0.66	0.91	4.55
	35. Is the hot-water valve marked with color?	0.83	1	4.7

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Dimensions of the structural fitness	Question (yes, somehow, no)	Validity		
		Content validity		Face validity
		CVR	CVI	
	36. Does the toilet bowl have 30 cm distance from walls?	0.66	0.91	4.55
	37. Is the floor of the toilet made of non-slippery materials?	1	1	4.9
	38. Is a horizontal assisting handle available at a height of 70 cm from the floor level and 20 cm ahead of the front edge of the toilet bowl on both sides of the toilet?	0.66	1	4.65
	39. Is there a platform for sitting during ablution?	0.66	1	4.5
	40. Is the size of the washbasin suitable? (at least 45 × 60 cm)	0.66	0.91	4.2
	41- Has the washbasin been installed at a height of 75 to 80 cm?	0.66	1	4.6
	42. Is an empty space available up to a height of 75 cm below the washbasin for placing a wheelchair?	0.83	1	4.7
	43. Is the height of the bottom edge of the mirror at a maximum of 90 cm, which can be used by wheelchair users?	0.66	0.91	4.2
	44 - Is the height of the hanger and the soap rack for wheelchair users a maximum of 80 cm from the floor level?	0.66	1	4.25
	45- Is there enough lighting in the toilets?	0.83	1	4.8
E: Evaluating the doors	46- Is the width of the doors inside the mosque at least 80 cm and suitable for wheelchairs?	0.83	1	4.7
	47. Are the handles of doors and windows at a height of 85 to 120 cm for the convenient access of wheelchair users?	0.83	1	4.15
	48. Is there at least one exit for every 50 individuals?	0.66	1	4.35
	49. Are the exit doors in the evacuation route opened to the outside?	0.66	1	4.7
F: Evaluating the corridors and internal paths	50. Is there enough light in the inner paths during the day?	0.66	1	4.75
	51. Is there enough light in the inner paths during the night?	1	1	4.75
	52. Is the floor of the corridors inside the mosque perfectly smooth?	1	0.91	4.8
	53. Is the floor of the corridors inside the mosque non-slippery?	0.83	0.83	4.8
	54. Are the switches and sockets at a height of 85 to 120 cm?	0.66	1	4.45
	55. Are the corridors inside the mosque in order and without any obstacle or additional equipment (such as wire, flowerpots, etc.)?	0.66	0.83	4.6
G: Evaluating the elevator (if exists)	56. Is there at least one elevator for the disabled, if the toilets and prayer halls are not located on the ground floor?	0.83	1	4.3
	57. Is the width of the elevator at least 80 cm?	0.66	1	4.65
	58. Is the plate of the elevator buttons located at a height of 90 to 120 cm from the floor level?	0.83	0.91	4.45
	59. Do the symbols, numbers, and buttons have enough colored contrast that can be identified by the elderly?	0.83	0.91	4.55
	60. Are the diameters of the symbols, numbers and buttons at least 2 cm?	0.66	0.91	4.25

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Dimensions of the structural fitness	Question (yes, somehow, no)	Validity		
		Content validity		Face validity
		CVR	CVI	
	61. Is there a drop between the elevator and the floor level?	0.83	1	4.7
H: Evaluating special chairs for prayer	62. Are there special chairs for the elderly?	1	1	4.65
	63. Does the number of chairs fit with the number elderly people (according to the curator's view and the number of elderly people)	0.83	0.91	4.45
	64. Are the special chairs for prayer stable and firm with a tight handle for support?	0.83	0.91	4.6
	65. Are the special chairs for prayer light and easily movable?	0.83	1	4.5
	66. Is the slope of the chair seat 5 to 15 degrees frontward?	0.83	0.91	4.25
	67- Is the height of the chair 37 to 45 cm?	0.66	0.91	4.5
I: Evaluating amenities	68. Is the courtyard of the mosque smooth?	0.83	0.91	4.7
	69. Does the courtyard of the mosque have non-slippery surfaces?	0.83	0.91	4.75
	70. Do the windows have a canopy or curtain for sunlight control?	0.83	0.83	4.3
	71. Are the proper heating and cooling equipment available? (Temperature 21 to 24 ° C)	1	1	4.5
	72. Is there a suitable drinking fountain at a maximum height of 85 cm in an accessible route?	0.66	1	4.5
	73 - Is the hanging place for veils at a height of 150 cm?	0.66	1	4.3
	74. Is the plate holding the prayer turban at a height of 120 cm?	0.83	0.91	4.2
J: Evaluating the safety of mosque	75. Is a fire alarm system available?	1	1	4.45
	76. Is a fire extinguisher system available?	1	1	4.8
	77. Considering its weight, is the fire extinguisher system at an appropriate height? (Below 18 kg up to a height of 1.5 meters and over 18 kg at a height of 1 meter)	0.83	1	4.8
	78- Is an emergency lighting available?	0.83	1	4.8
	79. Is there adequate ventilation?	0.83	1	4.8
	80. Are the heating and cooling equipment in safe condition?	1	1	4.75

Table 3. The contribution of each domain in the tool

Row	Domain	number of questions	contribution of each domain
1	Evaluating the road	7	8.75
2	Evaluating the main entry to the building	3	3.75
3	Evaluating the status of drops, stairs, and ramps	16	20
4	Evaluating the toilets	19	23.75
5	Evaluating the doors	4	5
6	Evaluating the corridors and internal paths	6	5.7
7	Evaluating the elevator	6	5.7
8	Evaluating special chairs for prayer	6	5.7
9	Evaluating amenities	7	8.75
10	Evaluating the safety of mosque	6	5.7

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Discussion

The structural fitness of public spaces is one of the factors that affect the quality of life and the independence of elderly people, and mosque as a meeting place in the neighborhood has the highest social participation of the elderly. Therefore, in this study, for the first time, in order to identify the dimensions of structural fitness through the study of issues related to age-friendly environments such as the city, park, pharmacy, and home, a tool containing 145 questions in 12 domains was made. Domains of this tool include evaluating the road, evaluating the main entry to the building, evaluating the status of drops, stairs, and ramps, evaluating the toilets, evaluating the doors, evaluating the corridors and internal paths, evaluating the elevator, evaluating special chairs for prayer, evaluating amenities, and evaluating the safety of mosque. A study was conducted by Rashmi in India in 2016 to evaluate an age-friendly hospital in which the domains of such a hospital were divided into five areas including access, medical services, physical environment of the hospital, hospitalization services, and spiritual services (18). Rashmi's tool consisted of 44 questions, of which 36% were similar to the questions of the current study. In Jafari Morjani's dissertation, which was conducted in 2009 to evaluate the sanatoriums of Fars and Isfahan provinces, a tool with 16 subscales including the location, stair and ramp, main entrance, corridors, bedroom, living room, bathroom, toilet, kitchen, dining room, treatment and rehabilitation room, staff and management room, prayer room, library, laundry, and yard in the form of 80 questions was prepared (19). That the comparison of questions shows that 29% (23 questions) of the questions are similar to the ones of the present study. In a study by Bastani, the tool for an age-friendly pharmacy in four domains of physical, caregiving, drug provision, and emotional was set up in the form of 28 questions (20). In which only questions of physical structure that involved 25% of the questions (7 questions) were similar to the tool in this study. These questions include the number of stairs, adequate light, a proper space, the existence of an elevator, an entry door, a proper floor covering, and a proper chair, which are the most important issues for the elderly to attend public places. Lavari's study shows that stairs (22, 23) and the absence of appropriate toilets are of great concerns of the elderly for attending a community (24). In this study, given the fact that part of the architecture of mosque is allocated to toilets, therefore, the highest number of questions is focused on this issue, which includes 23.75% (19 questions) of the questions of the tool. In the case of stairs, 20% of the questions (16 questions) were assigned to this domain.

The mean of the content validity index of the final tool in this study was 0.96, which is in accordance with a recommendation by Polit et al. who suggested a mean above 0.90. The Cronbach's alpha coefficient in this study was 0.875, which indicates that the internal consistency of the tool is appropriate. In the study by Bastani in Shiraz in 2016, almost the same number was obtained similar to this study and Cronbach's alpha was 0.85 (20). Concerning the contingency between the two testers, 82.12 was obtained, which was similar to the Lin's study that carried out with the aim of evaluating the housing and determining the appropriate interventions using the Swedish environmental fitness evaluating tool. The contingency percentage for this study that conducted in the United States in 2016 was 80% (1).

It can be said that in order to achieve a standard position for age-friendly mosques, there is a need for planning, evaluating, and continuous supervision. Some recommendations have been proposed to improve the current position of the mosques using the tool of this study. In fact, by focusing on the accessibility of urban spaces for the elderly people, who are considered part of the vulnerable citizens, its positive consequences can be seen in the entire society. Therefore, it is one of the society's needs to address both the structural fitness for the elderly and the necessity of having a tool to examine it.

According to studies, one of the advantages of this study is this is the first time such a tool has been developed. One of the limitations of the study was the adjustment of components and scope of the tool, which required knowledge and skills that a lot of time was spent on by the members of the research team. Interviews with the elderly and finally the opinions of the elderly can be mentioned. It seems that

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the elimination of the condition of the mosque ventilation area, which was removed during the review meetings of the research team, is also one of the limitations of the study. In terms of air supply, the only question was: Is there proper ventilation? This was integrated in the field of mosque safety assessment.

It is suggested that in future studies, considering the possibility of pandemics such as SARS, Mers and Covid 19, more attention be paid to the discussion of proper ventilation and air volume in public environments. It is also recommended to prepare a checklist for different places, such as health centers, hospitals, laboratories, banks and shopping centers according to the type of activity and the necessary measures for aging.

Conclusion

The evaluation tool of age-friendly mosques is available with appropriate reproducibility to evaluate structural barriers in public places, including mosques. Creating a valid and trustworthy version has important implications for modifying the environments for optimal use of the elderly. By studying the evaluation tool, it is anticipated that the problems of access to the elderly in the mosque and other spaces would be identified and accessibility would be encouraged in the society**.**

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