

## Development and Psychometric Evaluation of the Low Vision Individuals' Home Modification Questionnaire: Psychometric Study

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### Original Article

#### Abstract

**Introduction:** Visual impairment makes individuals dependent on tools in their daily activities. Home modifications are one of the important methods for increasing the independence of individuals with visual impairments as all individuals frequently interact with their home environment in their everyday lives. This study was an endeavor to develop the Home Modification and Improvement Questionnaire for visually impaired people and study its psychometric characteristics.

**Materials and Methods:** A cross-sectional study of questionnaire development and validation was conducted. The structure of the questionnaire was completed in 3 stages, defining the structure, creating items, and determining the format. The instrument was validated in the 3 stages of assessing the items, checking the face, content, and structural validity, and reliability of the retest-test, and performing a pilot study of the instrument. Exploratory factor analysis was performed to calculate the validity of the construct. The Kaiser-Meyer-Olkin test was used for factor analysis and the correlation between questions was evaluated using Bartlett's test.

**Results:** Exploratory factor analysis with varimax rotation yielded 3 factors (light, color, and home architecture) with eigenvalues of greater than 1 and factor loadings of greater than 0.3. Cronbach's alpha coefficients (index of internal consistency) of the scales of performance, knowledge, and attitude were 0.81, 0.88, and 0.69, respectively ( $P \leq 0.001$ ). The intra-class correlation coefficients (ICCs), as the measure of test-retest reliability, of the scales of performance, knowledge, and attitude were 0.82, 0.87, and 0.78, respectively.

**Conclusion:** Living comfortably at home for low vision individuals requires the consideration of the 3 elements of light, color, and home architecture and establishment of a planned and organized atmosphere. The current questionnaire can be utilized as a quantitative tool to evaluate the attitude, knowledge, and performance of this population's families in terms of their contribution to addressing the needs of this population.

**Keywords:** Vision, low; Psychometrics; Performance; Knowledge; Attitude

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#### Introduction

The prevalence of visual impairment and blindness around the world is a matter of great concern, especially in developing countries. According to recent reports, of the 7.79 billion people worldwide in 2020, approximately 1.49 million individuals were affected by blindness, representing 0.62% of the population. Furthermore, 255 million individuals

experienced visual impairment, accounting for 3.24% of the global population. According to the World Health Organization (WHO), the prevalence of low vision and blindness varies regionally, ranging from 1.1-3% and 0.3 to 5.6%, respectively (1). In Iran, the population with blindness is estimated at about 1.02%, and the population of the visually impaired individuals is estimated at about 2.85% of the total

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population (2). Moreover, as the world's population ages, more elderly people are becoming affected by vision disorders and related issues like cataracts, glaucoma, diabetic retinopathy, and age-related macular degeneration, which have an impact on their quality of life (QOL) (3). Visual impairment is the third most prevalent physical impairment in the elderly (4). In general, visual impairment severely affects a person's performance in activities of daily living (ADL) and instrumental daily activities (iADL) (5). In the same way, visual impairment in old age is associated with changes in life habits and loss of independence, and has many consequences (6). Previous research has shown that visual impairment greatly increases the risk of falling, hip fracture, depression, social isolation, and also increases the rate of admission to nursing homes (7). Low vision individuals show about 30% more dependence in ADL than their healthy counterparts (8, 9).

Living in the home environment is an important part of people's experiences, because individuals constantly interact with their home environment in their daily lives (5). One of the crucial strategies for increasing the independence of disabled people is to focus on environmental factors and provide solutions for modifying their living environment. Home improvement is modifying the living environment of individuals in a way that facilitates the functioning of a visually impaired or disabled person and increases the safety of their environment (10). Typically, modifications involve changes or additions to the structure of a building, such as installing railings. Modifications may also include moving, reconstruction, and redecoration. Moreover, even many visually impaired individuals do not have a comprehensive understanding of their needs in the home and living environment (11). In order to determine the support and care that visually impaired people in various age groups need, Johansson et al. (12) conducted a thorough survey using an open and structured questionnaire and reported the unmet needs of this population.

The needs of the visually impaired individuals, and their capabilities and lifestyle should be taken into account when making home modifications. In developed countries, principles and standards have been established for home modification to improve accessibility and maintain independence for the elderly and disabled individuals. However, despite the establishment of these principles and in some cases their observance, studies have shown that individuals in these homes still face many problems; it seems that more considerations are required to improve the conditions of visually impaired

people in these houses (13).

So far, no study has been conducted on the attitude, knowledge, and performance of family members of visually impaired individuals regarding the principles of home modifications and their environmental conditions. In some studies visually impaired people were qualitatively interviewed regarding the environmental conditions required for their daily life (14). Although the family plays a vital role in meeting the needs of visually impaired individuals and providing them emotional support, no specific tool has been developed to evaluate the attitude, knowledge, and performance of family members of visually impaired individuals (5). This study was conducted to identify the living requirements of visually impaired individuals by reviewing and analyzing available literature and obtaining the recommendations and opinions of optometry, occupational therapy, and other rehabilitation sciences experts. A questionnaire was also designed and validated to investigate the attitude, knowledge, and performance of family members of visually impaired individuals regarding home modification principles.

### Materials and Methods

This cross-sectional study was conducted in Mazandaran, Iran, in the year 2021 to develop and validate a questionnaire. The structure of the questionnaire was developed in 3 stages, defining the structure, creating the items, and determining the format. The validity of the questionnaire was also assessed in 3 stages, evaluating the items, pilot testing the instrument, and determining its psychometric properties (15). Primarily, based on the research question "What are the attitudes, knowledge, and performance of low vision families regarding the principles of home modification?", a search was conducted using the keywords Home Modification, Low Vision, Home Architecture, and Questionnaire. All articles and guidelines available in Persian and English in online databases and published before March 2022 were retrieved.

A comprehensive search was carried out by 2 researchers (SH and MM), and any discrepancies or disagreements were resolved through consultation with the third researcher (MGh). The outcome of this search was a fact sheet and a guideline.

A flowchart was depicted using all the information and recommendations extracted from the articles and sources regarding the arrangement, modifications, and adaptations of homes for visually impaired individuals. The main title was determined

based on the research objectives and divided into subheadings. Each subheading was further divided into divisions. Each subheading was rated according to research team consensus. Agreed on the total score for the questionnaire, each subheading and each division of every subheading received a weighted score depending on its importance compared to its categories. The scoring process, in a tree-like structure, determined the value of each subheading and helped in creating a question bank and determining the number of questions for each subheading. In the second step, questions were formulated based on the value of each subheading. Considering the mentioned titles, 17 items were created for the attitude domain, 17 items for the knowledge domain, and 17 items for the performance domain. It should be noted that the items in all three domains were similar, and only the type of question and the scaling of the response were adjusted to assess attitude, knowledge, and performance. In the third step, the questionnaire format was determined. For knowledge, a dichotomous scale (yes/no) was used. For performance, a 5-point Likert scale (never: 1, rarely: 2, sometimes: 3, often: 4, always: 5) was developed. For perspective, a 5-point Likert scale (completely agree: 1, somewhat agree: 2, neutral: 3, somewhat disagree: 4, completely disagree: 5) was considered (16, 17). Finally, each of the 17 items in each domain (attitude, knowledge, and performance) was discussed in the consensus (17) considering the importance of categories and scoring based on a tree diagram. The number of questions for each domain was reduced from 17 to 14 when redundant concepts were eliminated, and necessary revisions were made.

To assess face validity, the final version was discussed in two rounds. In the first round, 3 experts other than the researchers (2 optometrists with over 10 years of work experience in the field of vision rehabilitation and 1 occupational therapist with over 10 years of clinical work experience) were asked to evaluate the clarity and simplicity of the questions. It is recommended to have between 3 and 5 panel members for assessing face validity (18). Their comments were received and the necessary corrections were made in a single session. The final version of the questionnaire was then given to an expert in Persian language and literature. The expert reviewed and modified the final version in terms of the structure and grammar of the Persian language (19).

In the second step of preparing the questionnaire, the content validity of the tool was examined by calculating its content validity ratio (CVR) and content validity index (CVI) (20, 21) using the

feedbacks received from 10 experienced individuals (18). The expert panel consisted of 3 experts with a Ph.D. in optometry, 4 experts with a Ph.D. in occupational therapy, and 3 experts with a M.Sc. in occupational therapy, all with over 10 years of clinical work experience in the field of low vision.

In the assessment of CVR, items with a CVR equal to or greater than 0.62 were deemed necessary and were not removed. Items with a CVR between 0 and 0.62 and an average numerical judgment (average of panel members' responses) equal to or greater than 0.51 were also accepted, while items with a CVR of less than 0 and an average numerical judgment of less than 0.51 were removed. Moreover, a score of 0.79 was considered as an acceptable CVI for the questionnaire items. If an item received a lower score based on the mentioned criteria, it was removed (22). After confirming content validity, the opinions of 24 family members of visually impaired individuals were sought. They were asked to complete the questionnaire and provide feedback. After further discussion with the expert panel, the necessary changes were made.

The study inclusion criteria were severe or very severe visual impairment as approved by the Medical Commission of the Welfare Organization of Mazandaran province. With reference to the ethical code (IR.MAZUMS.REC.1397.2901) obtained from the Medical Ethics Committee of Mazandaran University of Medical Sciences, Iran, an official letter of introduction was sent from the School of Allied Medical Sciences to the Welfare Organization of Mazandaran to receive the contact details of registered individuals with severe and very severe visual impairments. The study exclusion criteria included disabilities other than visual impairment and unwillingness to participate in the study or lack of cooperation of caregivers of the patient. Sampling was performed through a census approach. Subsequently, individuals were contacted and provided with an explanation of the study's objectives. If they agreed to participate, the questionnaire was completed via telephone interviews with the caregivers. Participants had the freedom to discontinue the interview if they wished. To assess its test-retest reliability, the questionnaire was administered again to 120 participants after a 10-day interval. After collecting the questionnaires, internal consistency was analyzed using Cronbach's alpha for the 3 domains (18, 23). A Cronbach's alpha above 0.70 was considered acceptable (24). Test-retest reliability was calculated using the intra-class correlation coefficient (ICC), and an ICC of greater than 0.75 was considered acceptable (25). Content

validity was determined by checking the CVI and CVR (17, 26, 27). A CVR equal to or greater than 0.79 (28) was acceptable. However, some studies suggest that a CVR equal to or higher than 0.70 (29) or 0.8 (30) is acceptable.

The structural validity of the questionnaire was analyzed using exploratory factor analysis and varimax rotation. To perform the factor analysis, the Kaiser-Meyer-Olkin (KMO) test was first used; given that the correlation between the test questions is the basis of factor analysis, Bartlett's Test of Sphericity was used to determine whether the correlation between the variables was 0 or not. Subsequently, the main components were extracted and the matrix of the factor loading of the questionnaire questions was calculated. The significance level was considered to be 0.05 in all cases (18, 20). The limit of ceiling and floor effect was considered to be 15% (31).

## Results

No Persian study was found during the database search. Articles from ISI, Web of Sciences, PubMed, and Scopus were extracted or retrieved through the Google Scholar search engine. A questionnaire was developed to investigate the attitude, knowledge, and performance of family members of visually impaired people regarding the principles of home design and modification and it was psychometrically evaluated. The CVR for all 14 items was higher than 0.62, and no item was removed. The CVI for all questions was higher than 0.79, and the average CVI of all items was 0.92. The questionnaire had 3 domains: light and color, which are within the area of optometrists, and architecture. The architecture domain includes modifications and reforms at levels 1 and 2, which is within the specialty of occupational therapists in home improvement. However, there were no major changes at level 3, which is within the field of architecture, and therefore, architectural experts were not used as members of the expert panel. Questionnaires were completed by caregivers of severely and very severely visually impaired people of 25-44 years of age in Mazandaran province. Of the 122 eligible individuals, 2 individuals did not want to participate in the study, and therefore, the questionnaire was completed by 120 individuals. The demographic characteristics of the participants are presented in table 1.

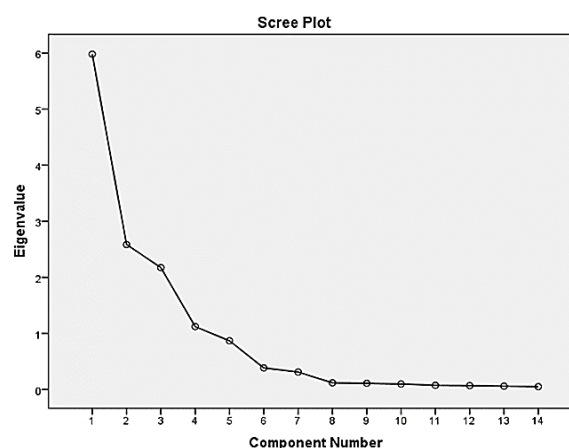
The KMO test confirmed the adequacy of the sample size (KMO = 0.89). Correlation between test questions was confirmed using Bartlett's sphericity test ( $P = 0.001$ ; Chi-square = 9892.95). In the factor analysis using varimax rotation, 3 factors with eigenvalues higher than 1 and factor loadings higher than 0.3 were obtained (Figure 1).

**Table 1.** Demographic characteristics of the sample

Variables	Categories	Count (Percent)
Age (year) (mean $\pm$ SD)	-	32.21 $\pm$ 4.80
Gender [n (%)]	Female	50 (41.7)
	Male	70(58.3)
Marital status [n (%)]	Married	76 (63.3)
	Single	44 (36.7)
Education [n (%)]	Elementary	18 (15)
	Middle School	36 (30)
	High School	50 (41.7)
	College	16 (13.3)
Location [n (%)]	Urban	82 (68.3)
	Rural	38 (31.7)
Disability severity [n (%)]	Sever	34 (28.3)
	Very Sever	86 (71.7)

SD: Standard deviation

According to the scree plot, 3 factors had a specific value higher than 1, and this number of extracted factors confirmed the number of subsections (subscales) created by the authors of the questionnaire.



**Figure 1.** Modifications of blind individuals' homes based on exploratory factor analysis

Table 2 shows the factor loadings of the items of the questionnaire for the 3 extracted factors. Items with a factor loading of greater than 0.3 were assigned to 1 factor. If an item had a factor loading of higher than 0.3 in more than 1 component, the highest factor loading obtained for that item was considered in assigning the item to the factors. Cronbach's alpha coefficients were calculated to check the reliability of subscale scores (Table 2). For items 10 and 11, Cronbach's alpha could not be calculated due to the small number of questions in the home architecture factor. The effects of the ceiling and floor did not appear in this questionnaire.

**Table 2.** Factor loadings matrix of the Low Vision Individuals' Home Modification Questionnaire on the extracted components

No.	Domain	Question content	Factor load of the first component			Factor load of the second component			Factor load of the third component			Cronbach's alpha		
			A	K	P	A	K	P	A	K	P	A	K	P
3	A	It is better to mark the edges of the doors and windows with contrasting colors so that a visually impaired person can easily see them.	0.89	0.66	0.73						0.83	0.61	0.77	
	K	Did you know that for better visibility of doors and windows, it is better to mark their edges with contrasting colors?												
	P	Have you ever marked the edges of doors and windows with contrasting colors so that a visually impaired person can see them better?												
4	A	It is better to mark the edges of stairs or non-level surfaces with a contrasting color band so that a visually impaired person can recognize them more easily.	0.87	0.81	0.65									
	K	Did you know that if there are stairs or non-level surfaces in the house, by marking their edge with a colored strip contrasting the background color, a visually impaired person can recognize them more easily?												
	P	Have you ever marked the edges of stairs and non-level surfaces with a contrasting color strip to make it easier for the visually impaired to recognize?												
5	A	It is better to mark door handles and locks, switches, and sockets with a contrasting color to the background, so that a visually impaired person can find them more easily.	0.68	0.66	0.84									
	K	Did you know that by marking door handles and locks, switches, and sockets with a contrasting color to the background, a visually impaired person can find them more easily?												
	P	Have you ever marked doorknobs and locks, switches, and sockets with a contrasting color to make it easier for a visually impaired person to find them?												
6	A	It is better to mark glass doors and stick colored cloth and paper of a contrasting color to the wall, so that the visually impaired person can be able to see the wall or the glass doors and not collide with them.	0.76	0.94	0.81									
	K	Did you know that it is possible to prevent visually impaired people from walking into glass doors by pasting contrasting colored cloth, paper, or markings on the wall or on the glass doors?												
	P	Have you ever pasted colored cloth or paper on the wall or marked glass doors to prevent the visually impaired person from hitting them?												
7	A	It is better to use plain and integrated floor coverings in the room or simple tablecloths, so that a visually impaired person can find dropped items more easily.	0.66	0.89	0.81									
	K	Did you know that by using plain and integrated floor coverings in the room or simple tablecloths, when an item falls on the ground, a visually impaired person can find it more easily?												
	P	Have you ever used plain floor coverings and tablecloths so that a visually impaired person can easily find a dropped item?												

**Table 2.** Factor loadings matrix of the Low Vision Individuals' Home Modification Questionnaire on the extracted components (continue)

No.	Domain	Question content	Factor load of the first component			Factor load of the second component			Factor load of the third component			Cronbach's alpha		
			A	K	P	A	K	P	A	K	P	A	K	P
12	A	It is better to have an additional source of light (such as a flashlight) available to a visually impaired person, so that he/she can function more independently.	0.78	0.69	0.38									
	K	Did you know that placing an additional light source (such as a flashlight) within the reach of a visually impaired person can help him/her function more independently?												
	P	Have you ever provided an additional source of light (such as a flashlight) to a visually impaired person so that he/she can function more independently?												
13	A	It is better to consider sufficient and adjustable lighting in the home, especially in the corridors and staircases, so that a visually impaired person can move around without risk and perform their daily tasks.	0.88	0.77	0.89									
	K	Did you know that installing sufficient and adjustable lights in the home environment, especially in corridors and staircases, can help the visually impaired person to move around without risk and perform their daily tasks?												
	P	Have you ever provided sufficient and adjustable lighting in your home so that the visually impaired person can move around without risk and perform their daily tasks?												
14	A	It is better to mark the required buttons of household appliances such as microwave oven, rice cooker, TV control, air conditioner, etc., so that a visually impaired person can use them more easily.	0.96	0.85	0.68									
	K	Did you know that by marking the required buttons of household appliances such as microwave oven, rice cooker, TV control, air conditioner, etc., a visually impaired person can use them more easily?												
	P	Have you ever marked the required buttons of home appliances such as microwaves, rice cookers, washing machines, air conditioners, etc. to make them easier for the visually impaired to use?												
1	A	It is better not to move household items without the knowledge of a visually impaired person.				0.77	0.94	0.63				0.65	0.62	0.60
	K	Did you know that you should inform the visually impaired person if you move household items?												
	P	Have you ever informed the visually impaired person about the moving of household items?												
2	A	It is better to place large furniture such as sofa, table, piano, etc. next to the wall, so that a visually impaired person is able to move around the room more easily.				0.39	0.82	0.84						
	K	Did you know that by placing large items such as a sofa, desk, piano, etc. next to the wall, a visually impaired person can move around the room more easily?												
	P	Have you ever placed large items such as a sofa, desk, piano, etc. next to the wall so that a visually impaired person can move around the room easily?												

**Table 2.** Factor loadings matrix of the Low Vision Individuals' Home Modification Questionnaire on the extracted components (continue)

No.	Domain	Question content	Factor load of the first component			Factor load of the second component			Factor load of the third component			Cronbach's alpha		
			A	K	P	A	K	P	A	K	P	A	K	P
8	A	It is better to stick small pieces of carpet or rug in the room on the floor to prevent the visually impaired person from slipping.				0.90	0.68	0.67				0.65	0.62	0.60
	K	Did you know that if there are small pieces of carpet or rug in the rooms, it is better to stick them on the floor to prevent the visually impaired person from slipping?												
	P	Have you ever stuck small pieces of carpet or rug in the rooms on the floor to prevent the visually impaired person from slipping?												
9	A	It is better to cover the house with non-slip flooring, especially the bathroom and stairs to prevent the visually impaired person from slipping.				0.85	0.65	0.75						
	K	Did you know that in order to prevent the visually impaired person from slipping, the floor of the house, especially the bathroom and the stairs, should be non-slippery?												
	P	Have you ever covered the floor of the house, especially the bathroom and the stairs, with non-slip flooring in order to prevent the visually impaired person from slipping?												
10	A	It is better for the floor of different parts of the house to be level in order to reduce the possibility of falling and injury of the visually impaired person.							0.75	0.77	0.90			
	K	Did you know that it is better for the floor of different parts of the house to be level in order to reduce the possibility of falling and injury of the visually impaired person?												
	P	Have you ever leveled the floor of different parts of the house to reduce the possibility of a visually impaired person falling?												
11	A	It is better to install railings in the corridors and stairs so that the visually impaired person can move safely around the house.							0.69	0.61	0.80			
	K	Did you know that placing a railing on the stairs or in corridors can increase the safety of the visually impaired person in moving around the house?												
	P	Have you ever installed railings in the corridors and on stairs so that the visually impaired person can move safely around the house?												

A: Attitude; K: Knowledge; P: Performance

To assess the test-retest reliability of the questionnaire, the ICC was calculated which was higher than 0.8 for the performance and knowledge scales and was 0.78 for the attitude scale (Table 3).

**Table 3.** Cronbach's alpha coefficient and intraclass correlation coefficient for test-retest of the home improvement of the low vision individuals' home modification questionnaire

	Cronbach's alpha	N	ICC	P-value
Performance	0.81	40	0.82	≤ 0.001
Knowledge	0.88	40	0.87	≤ 0.001
Attitude	0.69	40	0.78	≤ 0.001

ICC: Intra-class correlation coefficient

### Discussion

A questionnaire was developed to investigate the attitude, knowledge, and performance of the family members of visually impaired individuals regarding the principles of home layout, and in general, the design of these people's physical environment and it was psychometrically tested. The final questionnaire contained 14 items in three areas (attitude, knowledge, and performance), with the only difference being the type of question and response scale in each area. The questionnaire's content validity was acceptable, and the sample size allowed for inferences regarding the validity and reliability of the tool. The components identified by the factor analysis sorted the questions into three categories, entitled color and light, home design, and house architecture in accordance with the content of the questions.

Based on the results of the factor analysis, the 2 factors of color and light in the 3 domains of knowledge, performance, and attitude, all had Cronbach's alphas higher than 0.6. The number of components found in this study confirms the number of factors influencing the general principles of home modification for visually impaired people. Based on factor analysis, the factor loading of all items, except items 2 and 12, was relatively high, which shows the necessity of using these items in the questionnaire. However, despite the low factor load of questions 2 and 12, these two items were maintained in all domains because of their importance, the emphasis by the previous studies on the concepts addressed by these items (placing furniture next to the wall and using an additional lighting source) (14, 32), and the acceptable factor load of item 2 in domains of knowledge and performance, and item 12 in domains of attitude and knowledge. The construct of the questionnaire was valid. In terms of psychometric characteristics, the performance and knowledge

subscales of the questionnaire showed very high internal consistency and the attitude subscale had an acceptable Cronbach's alpha coefficient; this means that the items were homogeneous and had a good agreement ( $> 0.7$ ). In other words, all the items measured similar structure and no conceptual dispersion was seen. Moreover, the intra-category correlation coefficient of the 3 scales of performance, knowledge, and attitude (0.82, 0.87, and 0.78) showed that the repeatability of the questionnaire was good in all 3 areas.

Overall, light, contrast, and pattern are the main components of every environment and have a great impact on individuals' ability to learn and interact with that environment (33). In visual impairment, whether caused by brain damage, age-related eye diseases, or simply aging, the visibility of the environment strongly affects the individual's performance (32); therefore, the environment should be changed in a way that individuals with low-vision are able to use their potential visual processing abilities (11). Accordingly, it seems necessary to make changes in the main visual components of the environment in order to create a more visible texture (33). To maximize the visibility of the environment, modification of the 3 mentioned factors, i.e., home design, light and color, and home architecture, is essential.

According to previous studies, increasing the contrast of the main components of the environment by using contrasting colors with the background and surrounding objects, and using plane backgrounds instead of crowded and patterned ones improves the visibility of the environment and promotes the performance of people with visual impairments (33, 34). Therefore, a number of items (number 3-7 and number 14) were assigned to measure this concept. In addition to contrast and color, adjustable light intensity should also be taken into consideration to reduce glare and help visually impaired individuals (5). Enhancing the light intensity or using light with adequate quality can also increase the visibility of the environment (33). However, some individuals with visual impairments suffer from photophobia and high light intensity might be irritating for them (35, 36). Diabetic retinopathy, glaucoma, traumatic brain injury, and age-related macular degeneration, which are common causes of low vision, especially in the elderly, may cause photophobia (37). Moreover, high light intensity may cause visual stress and side effects such as tearing, glare discomfort, excessive blinking, headaches, and general eye discomfort (38). On the other hand, these individuals need more light to see the details and low light conditions may lead to vision



loss. Therefore, the use of adjustable and good quality lights can be helpful. This issue was addressed in items 12 and 13, which were categorized in the first factor class (color and light) according to the results of factor analysis.

Based on the results of factor analysis, questions 1, 2, 8, and 9 were categorized in the same domain. Reviewing these questions revealed that all of them were related to minor modifications such as moving household items and their arrangement, including stabilizing the carpets. Therefore, according to the nature of these questions, the second factor was named home design factor. One factor that can help to improve the performance of visually impaired individuals in their living environment is the creation of a structured and orderly environment that requires less visual attention (5, 14, 38). Crowded environments with unfamiliar objects are challenging even for people with normal visual processing (38). Therefore, reducing the number of objects and not changing the position of objects can help visually impaired people to function more easily.

According to the findings of the exploratory factor analysis, questions 10 and 11 have been categorized under the heading of "home architecture factors". These questions were related to leveling of surfaces and installation of railings wherever needed in order to maintain safety and reduce the risk of falling.

All the components discovered in this study were the same as the factors that Riazi et al. (14) extracted in their qualitative study. In their study, light and color, contrast, fear of falling (moving furniture and stabilizing carpets and rugs), and assistive devices were stated as the components needed to modify a home for visually impaired people. Moreover, the results of studies that have investigated home modifications for the elderly confirm the factors mentioned in the present questionnaire (14, 33, 34).

### Limitations

Since the questionnaire was designed with the aim of home modifications for visually impaired people, the component of assistive devices was intentionally not considered. One of the limitations of the present study was that the relationship between the person filling out the questionnaire and the visually impaired individual was not considered as it was not reported in all the cases. It seems that parents and spouses pay more attention to the needs of the individuals than their children; thus, reporting the relationship between the caregiver and the visually impaired person when using the questionnaire may be beneficial for further analysis. The absence of an

architectural expert with experience in designing medical centers was another limitation of the current study. The architectural factors covered in the questionnaire were based on changes and reforms at level 1 and 2 that are within the specialty of occupational therapists; therefore, this shortage may minimally affect the content validity of the instruments. Moreover, the expert panel lacked a person from the general population with a usual level of literacy; however, since part of the face validity phase recruited people with a normal level of literacy, this issue probably does not affect the results.

### Recommendations

By conducting the study in other provinces of the country with different economic, cultural, and educational levels, more comprehensive information can be obtained about the needs of this group of individuals, which may improve the quality of the questionnaire in the future. The economic level of the family, the social class, education level of the partner (or parents) in the studied sample may affect the results of this study; therefore, further investigation of the effects of these factors is recommended especially by administrating the present questionnaire as an outcome measure.

### Conclusion

Considering the role of the family of visually impaired people in meeting their needs, this questionnaire can be used as a quantitative tool to assess the attitude, knowledge, and performance of the family members of these individuals.

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Scientific and executive support of the study: Marziye Moradi-Abbasabadi, Samira Heydarian,

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Analysis interpretation of the results: Marziye Moradi-Abbasabadi, Masoud Gharib

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### Conflict of Interest

The authors had no conflicts of interest. Dr. Samira Hedarian obtained the funding for the present work from Mazandaran University of Medical Sciences and is working as an Assistant Professor at the Department of Rehabilitation, Marziye Moradi Abbasabadi has been a lecturer since 2015, Masoud Gharib has been an Assistant Professor since 2013, and Hasan Siamian has been an Associate Professor since 1999 at Mazandaran University of Medical Sciences.

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This study was based on the analysis of the data

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