Iranian Version of Speech, Spatial, and Qualities of Hearing Scale: A Psychometric Study

Yones Lotfi[1], Ahmad Reza Nazeri[1], Ali Asgari[2], Abdollah Moosavi[3], and Enayatollah Bakhshi[4]

[1] *Department of Audiology, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran*

[2] *Department of Psychology and Education, Kharazmi University, Tehran, Iran*

[3] *Department of Otorhinolaryngology, School of Medicine, Iran University of Medical Sciences, Tehran, Iran*

[4] *Department of Biostatistics, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran*

Received: 02 Jun. 2016, Revised: 04 Nov. 2016, Accepted: 05 Dec. 2016

Abstract- Evaluation of communication abilities in the elderly is crucial for activities which will be performed to improve their quality of life. A valid and reliable questionnaire is needed for assessing communication abilities. We aimed to translate and validate the speech, spatial, and qualities of hearing scale (SSQ) in Iran. The forward-backward procedure was applied to translate the questionnaire from English into Persian. After linguistic validation and pilot study, a cross-sectional study was carried out, and psychometric properties of the Iranian version of the SSQ were tested. Number of 333 elderly individuals with impaired hearing completed the questionnaire. Number 48.3% were hearing aid users and 51.7% was not. Reliability was assessed by internal consistency (Cronbach's alpha) and test-retest analysis. Exploratory factor analysis was performed for extracting factor structure of the Persian version of SSQ. Confirmatory factor analysis was performed to compare different models of factor loadings. The Mean age of participants was 62.00 years (SD=9.58 years), and the mean SSQ score was 5.1 (SD=1.2, ranged: 3.17-6.27). Reliability evaluation revealed high internal consistency and good test- retest reliability. Cronbach's alpha coefficient was 0.96 and the Pierson Correlation at test-retest analysis was 0.73 for Quality of hearing factor, 0.88 for Spatial and o.73 for Speech understanding factor. The results of exploratory factor analysis (EFA) indicated a four-factor solution for P-SSQ that jointly accounted for 52.40% of the variance observed. Confirmatory factor analysis approved the three factor solution but proposed a possible fourth factor. The Iranian version of the SSQ has acceptable psychometric properties, and it will be helpful for assessing different kinds of communication abilities in the Iranian elderly population.

Acta Med Iran, 2016;54(12):756-764.

Keywords: Self-assessment; Hearing ability; Speech; Spatial; Qualities of hearing scale

Introduction

The communicational problems of the elderly negatively affect various aspects of their lives (4). Such negative effects are also felt by companions including spouses (21). Considering the increased rate of the aging population worldwide and endeavors to increase the expectancy and quality of life of the elderly, it is necessary to be aware of the quantity and quality of communicational problems in this population (8).

Studies have shown that communicational skills in the elderly are affected and changed by various factors such as peripheral hearing loss (presbycusis), cognitive disorders, and the effect of aging on auditory processing abilities in the central nervous system (14). Identifying and measuring these communicational problems in order to find suitable methods to compensate for communicational abilities is dependent on valid and reliable tools which can be categorized into two general categories; physical (such as audiometers) and psychological (such as self-reports) (5). Psychological tools enable us to measure characteristics and problems in real life environments based on the personal judgment of individuals (5,25).

The use of self-report inventories has gained recent attention in audiology (25). These inventories can be used for a wide array of problems from identifying and categorizing problems related to hearing loss to

Corresponding Author: A.R. Nazeri
Department of Audiology, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran
Tel: +98 912 1856493, Fax: +98 21 77591707, E-mail address: ahmadrezanazeri49@gmail.com

determining the effectivity of different auditory rehabilitation methods (such as hearing aid prescription). The abbreviation profile of hearing aid benefit (APHAB) (3) and the hearing handicap inventory for the elderly (HHIE) (24) are examples of such inventories. The speech, spatial, and qualities of hearing scale (SSQ) is among the recent self-report tools for communicational problems caused by reduced hearing, especially in the elderly. Its main focus is on bilateral hearing processing (7).

This questionnaire was designed by the Institute of Hearing Research of the Medical Research Council of England for measuring individuals' abilities in three domains of speech comprehension, spatial hearing, and some related qualities. In the domain of speech comprehension, situations such as competing sounds, possibility to see other speakers, the number of involved speakers in a conversation, as well as several differences in background situations (silence, constant noise, reflection, and various other sounds) are measured (7). In the spatial domain, the individual's ability to process the direction, distance, and movement is evaluated. The quality of hearing domain was developed for measuring the segregation of sounds, recognition, clarity/naturalness, and listening effort (7). The structure of the SSQ has made it a suitable tool for evaluating different communicational abilities in people with hearing loss, especially in the elderly. It is mainly focused on skills and abilities related to binaural hearing processing and can reflect even small deviations related to binaural hearing abilities. Gatehouse and Noble (7), the main designers of the questionnaire did not perform factor analysis because of the low sample size. Therefore, Akeroyd and colleagues presented the results of their statistical analysis of the SSQ in a considerable sample in two articles published in 2011 and 2014. (1,2)

One of the problems that inter-cultural researchers face is the validation of measurements and scales because it cannot be easily assumed that developed tools for measuring constructs in one culture could be generalized to other cultures similarly. The comparability of the scores and measures of measurement tools in different cultural setting depends on their validity and equivalence (9).

Considering the importance of research on the communicational abilities of the elderly with hearing disabilities and the clinical value of this tool and since this questionnaire has not been validated in the Iranian population, we aimed to assess the psychometric characteristics of the SSQ in the elderly population of Iran in order to compare the factor structure of this questionnaire with that obtained for England.

Materials and Methods

Participants

In this study, 333 individuals (179 men and 121 women) with hearing loss who had referred to four active audiology centers in order to hearing evaluation, in the cities of Tehran, Mashhad, and Isfahan with the mean±SD age of 62±9 years (range: 47-93 years) were recruited (Table 1).

The questionnaire was completed by the participants under the supervision of trained audiologists. They were also trained by the researcher, and they gave necessary information to the participants on completing the questionnaire and answered their questions.

Table 1. The socio-demographic characteristics of the participants

Variable		n	%
Sex	**Women**	121	40.3
	Men	179	59.7
Hearing aid	**One**	95	31.7
	Two	50	16.7
	None	155	51.7
Dominant hand	**Right**	275	91.7
	left	25	8.3
Education	**Diploma**	240	80
	University	60	20
Hearing loss	**Sensory-neural**	274	91.3
	Mixed	8	2.7
	Transitional	18	6
Symmetry	**Symmetrical**	253	84.3
	Asymmetrical	32	10.7
	Complete hearing loss	15	5

Research tool

The SSQ (7,1,2,18) is one of the most important self-report tools related to communicational problems related to hearing loss, especially in the elderly. It has been designed for evaluating various communicational abilities of people with hearing loss, with an emphasis on skills related to binaural processing. The SSQ can even detect small deviations related to binaural hearing abilities. This questionnaire was designed by the Institute of Hearing Research of the Medical Research Council of England. It has three subscales, namely speech comprehension, spatial hearing, and hearing-related qualities with 49 items, scored on a scale of 0 (complete inability) to 10 (complete ability). Higher scores indicate higher hearing abilities (7).

The first subscale has 14 items and is related to speech hearing. It is used to evaluate situations such as competing sounds, possibility to see other speakers, the number of people involved in the discussion, and background conditions (silence, constant noise, reflection, and various other sounds). The second subscale has 17 items related to spatial hearing and evaluates the individual's ability to process direction, distance, and movement. The third subscale has 17 items and evaluates segregation of sound, recognition, clarity/naturalness, and listening effort (7).

Currently, the original version of the SSQ is freely available (version5/6 with 49 items) and can be downloaded from (www.ihr.mrc.ac.uk/products/display /ssq). Two benefit and comparison versions have been later designed; the former for comparing hearing abilities before and after intervention and the latter for evaluating the effect of different strategies for fitting hearing aids (10). The SSQ has been translated to various languages such as Danish, German, Swedish, Arabic, and Dutch (2)

Several shortened versions of the SSQ have so far been developed such as the 12-item from Noble *et al.*, (20) called SSQ12, the 5-item form introduced by Demeester *et al.*, (6) which is a valuable screening tool, and the 15-item form used for bilateral hearing function ,Kiessling *et al.*, (11). This questionnaire has also been validated in Australia for children with hearing loss as well as for their parent and teachers (26).

Translation and adaptation

The translation and adaptation of the questionnaire were done using the International Quality of Life Assessment method (15). Initially, the questionnaire was separately translated to Persian by three audiologists with expertise in English. The three translations were then adapted and unified over several sessions. Then, the translated version was examined and modified by 20 audiologists, and later a group consisting of a psychometrician, neurologist, linguist, and otolaryngologist examined cultural adaptation of the translated version. At this stage, the questionnaire was piloted using 5 elderly people with hearing loss who were asked to complete the questionnaire. Ultimately, the final Persian version was back-translated by an audiologist and a linguist and checked in a joint session with the researcher. The translated version was sent to Dr. Akeroyd at the MRC, and after incorporating his modifications, the final version was completed by the participants of this study.

Data analysis

The analysis was done in four stages. In order to determine the factor validity of the questionnaire, exploratory, and confirmatory factor analysis was performed. In this stage, in order to find the best model fit for data, the main model was compared to the models extracted by exploratory factor analysis. In the second stage, the simultaneous validity of the questionnaire was calculated by calculating the inter-factor correlation coefficient and the total score. In the third stage, in order to assess partial validity, the total score and the factor scores of those who used a hearing aid and those who did not be compared using the t test. Finally, in order to estimate the re-test validity coefficient, 29 individuals from the main sample were re-tested two weeks after the initial completion of the questionnaire.

Results

Considering the obtained results, item 16 of the quality factor, which is item number 47 in this study (When you are the driver of a car can you easily hear what someone is saying who is sitting alongside you?) and item 14 of the spatial hearing section, which is item number 28 in this study (Do the sounds of things you are able to hear seem to be inside your head rather than out there in the world?) were omitted from data analysis because of the low response rate to these two items.

It should be stated that in the main article (7), only 37 out of 153 participants expressed that they drove and answered item 47 on the quality factor. Moreover, item 28 on the spatial hearing section mostly applies to individuals who use hearing aids (Gatehouse S, 2004). Therefore, we practically analyzed a 47-item

questionnaire which we called the P-SSQ47.

Table 2 shows the mean and standard deviation of the three subscales and the total score of the SSQ as well as kurtosis, Skewness, and the results of the Kolmogorov-Smirnov test used to evaluate the normal distribution of the scores and the internal correlation coefficients.

Table 2. Descriptive statistics and K-S test of normality of Persian SSQ

Subscales	M	SD	skewness	kurtosis	D	α
Speech hearing	4.7	1.1	-0.25	0.27	0.92	0.88
Spatial hearing	5.2	1.5	0.34	0.19	1.10	0.94
Quality of hearing	5.6	1.2	0.06	-0.23	0.8	0.90
Total score	5.1	1.2	0.32	0.29	1.3	0.96

Note. D=Kolmogorov-Smirnov (K-S) test of normality. α = Cronbach's alpha.
None of the k-s tests is significant

As shown, the total score and the score of the subscales have a normal distribution. Kurtosis indices indicate a higher than a normal distribution with respect to the scores of hearing perception and spatial hearing as well as the total score of the questionnaire and lower for the hearing quality subscale. Moreover, the lowest internal correlation coefficient was 0.88 for the subscale (speech comprehension), and the highest coefficient was 0.94 for the subscale (hearing quality). The correlation coefficient for the complete questionnaire was 0.96.

Exploratory factor analysis

In order to explore the factor structure of the Persian version of the SSQ, we analyzed the main components using the varimax rotation method (Table 3).

Since items 28 and 47 did not match the socio-cultural structure of Iran and on average 48 people had not responded to them, they were deleted, and factor analysis was done on the remaining 47 items. Initial results showed that there were nine items with an Eigenvalue of more than 1 that defined about 65% of the variance. After several factor analyses using different methods of varimax rotation in order to extract suitable items, two factor structures consisting of three and four factors were selected and suggested with respect to the frequency and content as well as considering the Kaiser-Meyer-Olkin (KMO) measure (KMO=0.935), Bartlett's sphericity test (Bartellet=9059/52, P<0.0001), Scree plot, Eigenvalue, factor load more than 0.3, loading of at least 3 items in one factor, as well as recent findings suggesting a fourth possible item (2). Therefore, the Persian version of the SSQ could at most contain four factors (Figure 1). These four factors define 52.4% of the variance.

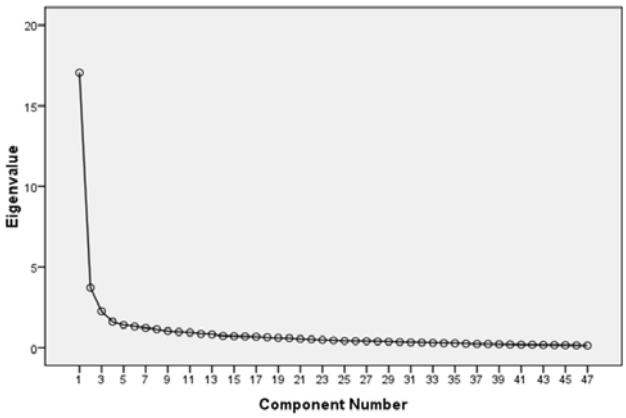

Figure 1. Scree plot for the components of the SSQ

However, the three-factor model that has been extracted based on the questionnaire's main structure, items 42,45,46, and 49 did not have factor loads higher than 0.3 in any of the factors. Moreover, item 14 did not have a significant factor load in the three and four-factor models. Table 3 shows that psychometric and statistical features of the factors including factor loads, mean, standard deviation, and homogeneity.

The first factor (17 items) was, in fact, the subscale of "quality of hearing." However, items 29,30, and 38 of the "spatial hearing" subscale and item 13 of the "speech comprehension" subscale also loaded on this factor. With an Eigenvalue=17.05, this factor defined approximately 20% of the variance.

The items of the second factor (14 items) are related to the spatial hearing subscale. In this factor, items 17,26,27, and 31 of the spatial hearing subscale and item 16 of the speech comprehension subscale had a factor load of more than 0.3. This factor could predict approximately 16.5% of the variance (Eigen value=3.73). The items of the third factor were related to

the speech comprehension subscale. This factor could predict 12% of the variance.

The fourth extracted factor in the present study is identical to items 45,46, and 49 of the fourth factor mentioned in Akeroyd's study (2). This factor could predict approximately 4% of the variance (Eigen value=1.60).

Table 3. Factor loadings, communalities, means and standard deviation of the items of Persian SSQ four factor solution

	Factors				Descriptive statistics		
Items	**I**	**II**	**III**	**VI**	**M**	**SD**	**h^2**
Q37	0.80	--	--	--	6.11	2.13	0.69
Q35	0.79	--	--	--	6.35	1.99	0.66
Q44	0.74	--	--	--	6.26	1.98	0.60
Q43	0.74	--	--	--	6.22	2.13	0.58
Q40	0.72	--	--	--	5.94	1.89	0.56
Q41	0.68	--	--	--	5.61	1.90	0.50
Q39	0.65	--	--	--	5.73	2.03	0.59
Q32	0.64	--	--	--	5.84	1.92	0.52
Q13	0.61	--	0.36	--	5.98	2.14	0.56
Q38	0.59	0.38	--	--	5.72	2.09	0.52
Q34	0.59	--	--	--	5.76	2.01	0.51
Q48	0.58	--	--	--	5.44	1.68	5.11
Q2	0.51	--	--	--	6.27	1.79	0.39
Q30	0.47	0.39	--	--	5.50	1.89	0.36
Q29	0.47	0.35	--	--	5.58	2.01	0.35
Q33	0.38	--	--	--	5.54	1.84	0.18
Q42	--	--	--	--	5.30	1.97	0.05
Q23	--	0.77	--	--	5.00	2.04	0.69
Q24	--	0.77	--	--	4.83	2.09	0.68
Q21	--	0.75	--	--	5.04	2.00	0.68
Q22	--	0.75	--	--	5.04	2.12	0.71
Q25	--	0.71	--	--	4.86	2.03	0.61
Q20	--	0.70	--	--	5.21	2.07	0.61
Q18	--	0.66	--	--	5.26	2.07	0.57
Q19	--	0.64	--	--	4.80	1.95	0.55
Q26	0.412	0.64	--	--	5.35	1.99	0.63
Q15	--	0.59	--	--	4.67	1.97	0.51
Q27	0.462	0.580	--	--	5.49	1.96	0.61
Q17	0.50	0.52	--	--	5.93	2.15	0.57
Q16	--	0.52	0.39	--	5.12	2.06	0.49
Q31	0.491	0.504	--	--	5.45	1.99	0.53
Q3	0.36	--	0.68	--	5.74	1.62	0.61
Q9	--	--	0.68	--	5.18	1.80	0.62
Q7	--	--	0.67	--	4.59	1.82	5.08
Q4	--	--	0.65	--	4.21	1.63	0.47
Q5	--	--	0.65	--	5.01	1.52	0.48
Q11	--	--	0.63	--	4.80	1.87	0.55
Q1	--	--	0.57	--	4.74	1.69	0.38
Q12	0.362	--	0.56	--	5.27	1.96	0.55
Q6	--	--	0.46	--	3.17	1.34	0.26
Q8	--	--	0.46	0.429	3.81	1.66	0.31
Q14	--	--	--	--	3.42	1.62	O.18
Q45	--	--	--	0.70	3.73	2.13	0.37
Q46	--	--	--	0.66	3.46	1.96	0.16
Q49	--	--	---	-0.37	5.13	1.80	0.05
α	0.934	0.946	0.879	0.556	--	--	--
Eigenvalue	17.05	3.73	2.25	1.60	--	--	--
%Variance	19.77	16.56	12.18	3.90	--	--	--
Test-Retest	0.73	0.88	0.73	--	--	--	--

Confirmatory factor analysis

In order to confirm the extracted factors of the Persian version of the SSQ and select a suitable model, confirmatory factor analysis was done using the LISREL software. The three models were compared in order to assess the accurateness of the extracted factors. The three factors of the original version of the questionnaire, the three-factor model, and the four-factor model were compared in the first, second, and third model, respectively (Table 4).

Table 4. The Goodness of fit statistics for CFA models of Iranian SSQ

Models	χ^2	df	χ^2/df	CFI	GFI	AGFII	IFI	RMSEA
Three-factors (original)	3392.39	1029	3.29	0.93	0.90	0.79	0.93	0.88
Three-factors (Persian)	2795.58	857	3.26	0.95	0.90	0.88	0.95	0.085
Four-factors (Persian)	4608.87	944	4.88	0.95	0.79	0.70	0.95	0.114

Note. CFI=Comparative Fit Index, GFI=goodness of fit index ,AGFII=Adjusted goodness of Fit index, IFI=Incremental Fit Index, RMSEA=Root Mean Square Error of Approximation, ** *P*< .001

In general, the model fit indices of the original three-factor model and the three-factor model of this study indicated a suitable and good model fit to data. However, the model fit indices for this study's three-factor model (IFI=0.95, CFI=0.95, GFI=90) showed that this model is relatively less fit to data compared with the original three-factor model.

Internal/concurrent validity

In order to assess the concurrent validity of the three factors and the total score of the Persian version of the SSQ, their correlation with the hearing loss score in both right and left ears of the sample was calculated. For internal validity, their correlation with each other was also calculated. Table 5 shows the related coefficients as well as the results of the descriptive statistics and the Kolmogorov-Smirnov test for assessing the normal distribution of the scores. As shown, positive and significant correlation coefficients between the scores of the subscales and the total score of the SSQ with each other, and also the negative and significant coefficients with the reduced hearing score in the right and left ears support internal and concurrent validity.

Table 5. Descriptive statistics ,inter-correlations among the Persian version of SSQ subscale and total scores and their correlations with hearing Loss

	Descriptive statistics					Correlation				
Subscales	**M**	**SD**	**Skew**	**Kurtosis**	**D**	**1**	**2**	**3**	**4**	**5**
1.Speech hearing	3.6	0.90	-0.26	-0.32	1.1	-				
2.Spatial hearing	4.2	1.2	0.16	0.25	0.97	0.69	-			
3.Quality of hearing	5.6	1.3	0.19	0.23	1.5*	0.52	0.66	-		
4.Total SSQ	4.5	1.1	0.17	0.24	1.2	0.89	0.92	0.76	-	
5.HLOSS-R	53.9	15.7	0.67	0.92	1.6*	-0.34	-0.44	-0.40	-0.44	-
6.HLOSS-L	53.7	15.6	0.37	0.58	1.1	-0.24	-0.39	-0.35	-0.36	-0.39

Note. D=Kolmogorov-Smirnov (K-S) test of normality
All correlation coefficients significant at the level of *P*<.01.

Partial validity

The difference between the participants with and without hearing aid was assessed based on the assumption that people with hearing loss who used hearing aid were more capable of speech comprehension, spatial hearing, and hearing quality (Table 6).

Table 6. SSQ total and subscales differences between people who use hearing aid and people do not use

	Group 1 (n=154)		Group 2 (n=145)		
Subscales	**M**	**SD**	**M**	**SD**	***t***
Speech hearing	5.94	1.3	5.15	1.2	5.44**
Spatial hearing	4.71	1.1	3.74	1.1	6.99**
Quality of hearing	3.87	0.82	3.29	0.88	5.91**
Total SSQ	4.91	1.1	4.12	0.86	7.11**

** $P<.01$

As shown in table 6, the mean scores of the subscales and the total score in the group with a hearing aid (group 1) was higher that the group without hearing aid (group 2). Therefore, people who do not use hearing aid experience more communicational problems. This finding confirms the partial validity of the SSQ.

Discussion

The aim of this study was to assess the psychometric characteristics of the SSQ in a sample of Iranian elderly with hearing loss. Confirmatory and exploratory factor analysis confirmed the factor structure of the main version (7,2). Despite the important basic sociocultural differences between Iran and England with respect to many concepts and constructs, this study revealed complete evidence on the structure of skills related to hearing perception, spatial hearing, and qualitative phenomena related to hearing which are measured by the SSQ. However, the results of this study are also consistent with the model obtained by Akeroyd *et al.,* (1) that showed a fourth factor called effort and concentration; although this factor is weak with respect to psychometric characteristics such as internal consistency coefficient and number of items.

Although this study is consistent with previous studies with respect to the validity and reliability of the SSQ, it also yields novel information. Actually, factor analysis confirmed the three-factor model of the main version, but some items were substituted in the Persian version. These differences are defined as follows:

Besides having a weak discrimination power, item 14 from speech comprehension part (You are listening to someone on the telephone, and someone next to you starts talking can you follow what is being said by both speakers?) did not have a significant factor load in any of the factors. The discrimination coefficient and the commonality of this item were 0.19 and 0.18, respectively, showing that most people had a weak performance in this situation. It seems that answering this question depends on the simultaneous concentration on two streams, and people with hearing impairment feel incapable in such situations (Gatehouse S, 2004). In Akeroyd *et al*., study (2), this item did not have a significant factor load as well, but the researchers did not provide further explanation.

Items 2(You are talking with one other person in a quiet, carpeted lounge room. Can you follow what the other person says?), and 13(can you easily have a conversation on the telephone?) are related to the speech comprehension factor in the original version; but in the Persian version, they had a significant factor loading in the hearing quality factor. Akeroyd *et al*., (2) also found that these two items did not have a significant factor loading. Since item 2 is among the two items (2 and 3) that assess speech comprehension in a quiet environment and most people (even those with hearing loss) do not have any problems in such environments, this item did not yield a sufficient factor loading on this factor. With respect to item 13, Akeroyd *et al*., (2) had mentioned that the simplicity of the designed situation is the reason for the item not loading sufficiently (2). However, in the factor analysis of the Persian version of this questionnaire, these two items yielded a significant factor loading on the third factor (quality of hearing). It seems that the Iranian respondents considered these items as items related to hearing the quality.

In the spatial hearing subscale, items 29 (Do the sounds of people or things you hear, but cannot see at first, turn out to be closer than expected when you do see them?) and 30 (Do the sounds of people or things you hear, But cannot see at first, turn out to be further away than expected when you do see them?) in the Persian version did not have significant factor loadings. In Akeroyd *et al*., study (2), items 28, 29, and 30 did not have significant factor loadings. Akeroyd mentioned that the different content of these three items compared with other items in this factor had caused the insignificant factor loadings. Of course, as mentioned before, in the Persian version, item 28 was deleted because of the low response rate. This item questions the perception of sounds inside or outside the head and is mostly designed

for people wearing hearing aids who experience such sounds because of the created blockage due to earmold or hearing aid receiver (7). However, in our study, it seems that some respondents did not fully understand the questioned concept in items 29 and 30 which asked about perceived distances and people's expectations. With respect to more loadings of these items on quality of hearing factor, it is possible also to conclude that Iranian respondents have considered perceived distance as a quality of hearing issue.

We also found that if four factors are extracted from the set of items, items 45, 46, and 49 would be considered as the fourth factor. These findings were consistent with another study (1). The content of these questions shows that their subject needs effort and concentration for better speech comprehension. Therefore, this factor could call effort and concentration. The small number of items and its low internal consistency coefficient shows that this factor must be further studied in future studies and suitable items should be later added.

The findings related to the validity coefficients are consistent with another similar study (Singh *et al.*, 2010). The range of internal consistency coefficients in this study was 0.88 (speech comprehension subscale) to 0.95 (spatial hearing subscale), indicating the high validity of the Persian version of the SSQ. The test-retest coefficients ranged from 0.73 (speech comprehension and hearing quality factor) to 0.88 (spatial hearing factor), indicating a suitable reliability for the Persian version. These coefficients are consistent with Singh et study (22) which was done in a 6-month time frame.

The average score over all items of the original SSQ (7) was 5.5 (SD=1.9).At this study, the average score over all items were 5.1 (SD=1.2). Although these values are almost similar but the cause for lower scores in Gatehouse *et al*., study (7) should be due to the mean age of their sample which is older than this study sample.(71 years versus 62 years).

The Persian version of the SSQ is a valid and reliable tool for evaluating the communicational problems of people with hearing loss. Although this study confirms the findings of previous studies with respect to the questionnaire's validity and reliability, it also sets forth new perspectives on hearing quality because it not only shows that this concept is similar across cultures but also necessitates theoretical studies on the existence of a fourth factor (effort and concentration). Since the content of this factor is similar across cultures, the conceptualization of hearing quality should be further studied, and more suitable items should be added.

Acknowledgment

This study was part of my dissertation for receiving Ph.D. degree in Audiology that was supported by Faculty of Audiology, University of Welfare and Rehabilitation Sciences, Tehran, Iran.

References

1. Akeroyd MA, Guy FH, Harrison DL, Suller SL. A factor analysis of the Speech, Spatial and Qualities of Hearing Questionnaire (SSQ). Int J Audiol 2011;51:262.
2. Akeroyd MA, Guy FH, Harrison DL, Suller SL. A factor analysis of the SSQ (Speech, Spatial, and Qualities of Hearing Scale). Int J Audiol 2014;53:101-14.
3. Cox R, Alexander GC. The abbreviated profile of hearing aid benefit. Ear Hear 1995;16:176-86.
4. Dayna S, Cruickshanks KJ, Klein BE, Klein R, Wiley TL, Nondahl DM. The Impact of Hearing Loss on Quality of life in older Adults. Gerontologist 2003;43:661-8.
5. Demorest ME, Walden BE. Psychometric principles in the selection, interpretation, and evaluation of communication self-assessment inventories. J Speech Hear Disord 1984;49:226-40.
6. Demeester K, Topsakal V , Hendrickx JJ , Fransen E, Van Laer L, Vn Camp G, et al. Hearing disability measured by the Speech, Spatial, and Qualities of Hearing Scale in clinically normal hearing and hearing- impaired middle – aged persons, and disability screening by means of reduced SSQ (THE SSQ5). Ear Hearing 2012;33:615-25.
7. Gatehouse S, Noble W. The speech ,spatial and Qualities of Hearing scale (SSQ). Int J Audiol 2004;43:85-99.
8. Gordon-Salant S, Frisina RD, Fay RR, Popper AN, eds. The Aging Auditory System. 1st ed. New York: Springer, 2010.
9. Hui CH, Triandis HC. Individualism-collectivism: A Study of Cross-Cultural Researchers. J Cross Cult Psychol 1986;17:225-48.
10. Jensen NS, Akeroyd MA, Noble W, Naylor G. The Speech, Spatial and Qualities of Hearing scale (SSQ) as a benefit measure. (Accessed March 2016, 12, at http://www.ihr.mrc.ac.uk/products/display/ssq).
11. Kiessling J, Grugel L, Meister H, Meis M. German translations of questionnaires SADl, ECHO, and SSQ and their evaluation. Z Audiol 2011;50:616.
12. Kobler S, Lindblad AC, Olofsson A, Hagerman B. Successful and unsuccessful users of bilateral amplification: Differences and similarities in binaural

performance. Int J Audiol 2010;49:613-27.
13. Kramer SE, kapteyn TS, Festen JM, Tobi H. Factors in subjective hearing disability. Audiology 1995;34:311-20.
14. Martin J, Jerger JF. Some effects of aging on central auditory processing. J Rehabil Res Dev 2005;24:25-44.
15. Bullinger M, Alonso J, Apolone G, Leplège A, Sullivan M, Wood-Dauphinee S, et al. Translating Health Status Questionares and Evaluating Their Quality: The IQOLA Project Approach. J clin Epidemiol 1998;51:913-23.
16. Most T, Adi-Bensaid L, Shpak T, Sharkiya S, Luntz M. Everyday hearing functioning in unilateral versus bilateral hearing-aid users. Am J Otolaryngol 2012;33:205-11.
17. Noble W, Gatehouse S. Interaural asymmetry of hearing loss, speech,spatial, and qualities of hearing scale (SSQ) disabilities and handicap. Int J Audiol 2004;43:100-14.
18. Noble W, Gatehouse S. Effects of bilateral versus unilateral hearing aid fitting on abilities measured by The speech, spatial, and qualities of hearing scale (SSQ). Int J Audiol 2006;45:172-81.
19. Noble W, Naylor B, Bhullar N, Akeroyd MA. Self-assessed hearing abilities in Middle and Olde-age adults, A Stratified sampling approach. Int J Audiol 2012;51:174-80.
20. Noble W, Jensen NS, Naylor G, Bhullar N, Akeroyd MA. A short form of the speech, spatial, and qualities of hearing scale suitable for clinical use: The SSQ12. Int J Audiol 2013;52:409-12.
21. Scarinci N, Worrall L, Hickson L. Factors associated with third-party disability in spouses of older people with hearing impairment. Ear Hear 2012;33:698-708.
22. Singh G, Pichora-Fuller MK. Older adults performance on the speech, spatial, and qualities of hearing scale (SSQ): Test- retest reliability and a comparison of interview and self-administration methods. Int J Audiol 2012;49:733-40.
23. Van Wieringen A, de Voecht K, Bosman AJ, Wouters J. Functional benefit of the bone-anchored hearing aid with different auditory profiles: Objective and subjective measures. Clin Otolaryngol 2011;36:114-20.
24. Ventry IM, Weinstein BE. The hearing handicap inventory for adults: a new tool. Ear Hear 1982;3:128-34.