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Original Article

Standardization (Translating and Evaluating the Validity and Reliability) of the Speech, Spatial, and Qualities of Hearing Scale Questionnaire-12(SSQ12) to the Persian Language

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ABSTRACT

Background: This study aimed to prepare the Persian version of Speech, Spatial, and Qualities of Hearing Scale questionnaire-12 (SSQ-12-Persian version) and assess its validity and reliability to facilitate the effect of the usage of hearing aids on individuals using them.

Methods: This study is considered an original research type of article. The questionnaire was translated to Persian according to WHO method. Firstly, two fluent Persian-speaking translators translated the questionnaire from Persian to English, and then three audiologists examined the questionnaire. The questionnaire was then translated from Persian to English and conceptually reviewed by two bilingual translators. Finally, 99 senior persons aged 22 to 52 years who used hearing aids and had their hearing thresholds assessed lately were given the Persian version of the Speech, Spatial, and Qualities of Hearing Scale 12 (SSQ-12) questionnaire. T-test examination and Cronbach Alpha were used to assess the reliability and validity and test-retest reliability.

Results: Persian version of the SSQ-12 questionnaire showed high internal consistency (assessed by Cronbach Alpha=0.924) and high test-retest (assessed by Cronbach Alpha=0.868) reliability.

Conclusion: SSQ-12 questionnaire is a comprehensive summary of the SSQ-49 questionnaire. It would be one of the valid questionnaires to evaluate hearing performance improvement in hearing aids users. The paired sample t-test revealed that the Persian version of the SSQ-12 questionnaire has good reliability and validity, and Cronbach's alpha revealed that the questionnaire has strong internal consistency (Cronbach's alpha=0.924). The reliability of the test-retest after a month was obtained, and the total scale result was 0.867. According to this study's results, SSQ-12 can be used as other Persian translated questionnaires like GHABP, SHQ, and IOI-HA for examining the effectiveness of hearing aids and their effects on limiting disabilities related to hearing loss.

Introduction

Hearing aid makers aim to increase the quality of speech, which includes making amends to diminish dynamic limits and suppress competitive speech noises. This target is the priority of the audiology rules and studies [1]. The auditory system has additional roles outside hearing speech, such as sound lateralization. People utilize their auditory sense to discriminate between everyday sounds and spoken speech [2]. Sounds occur all the time in

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our environment and come from a variety of sources. At the time, a sound is more prominent, the audience considering it, turning their eyes and heads towards the source and listening cautiously. The auditory system, and its operations, are integrated to perform hearing, listening, understanding, and communicating actions [3]. Audiologists have paid less attention to the ecological intricacies of human communication in the old days. The function measured in laboratories or clinics usually pays attention to the fragmented integrity of a sound whose distance position and spectral/temporal characteristics are constant and predictable. In older listeners with sensorineural hearing loss, measuring how much speech is heard via the headphones, along with frequency and temporal clarity, can only show how an individual can understand the target speech in the presence of predicted background noise [4]. In circumstances when a person stands in the room and sound is heard from numerous spoken and non-spoken sources, such measures are less predictable [5]. In these real-life settings, the person must lateralize, recognize, pay attention to the sound, and move attention between various sounds in order to interact with others [6]. Although the cochlear is usually the source of sensorineural hearing loss, the relationship between sensory and congenital aspects of hearing should affect how the person acts in real situations [7].

When a person is placed in more acoustically-needed environments, additional factors play a role. When an individual wants to listen to one person from a few speakers, selective attention is used in this way. However, he/she should be ready to listen to someone else if needed, this requires examining the auditory background for the occurrence of the novel stream to identify them and, if needed, focus attention on that event [8]. For an individual, to pay attention from one conversation to another, the events should be simultaneously checked and updated and attention should be attracted to them again. Acoustic changes may or may not occur in certain conditions, and the substance or meaning of the message may alter throughout this period. Binaural hearing is critical in this case [9]. Various studies reveal that peripheral hearing loss, cognitive illnesses, and the impact of aging on auditory central system abilities in sound processing all impair communication skills in older persons. Identifying and measuring these effects on communication skills requires reliable and accurate tools, which are generally divided into two groups: 1. device (audiometer) and 2. psychological (questionnaires). Studies reveal the possibility of assessing people's characteristics and problems in daily life based on individual judgments. Some of these questionnaires provide the possibility of evaluating, identifying, and classifying a wide range of psychological problems resulting from hearing loss and the effect of different rehabilitation methods such as hearing aid use [10]. Therefore, it can be concluded that previous tests are not efficient to measure people's perceptions in the mentioned situations. In 2004 Gatehouse and Noble decided to take a questionnaire with three main subscales: a) speech comprehension: environments with competitive sounds, the possibility of seeing other speakers, the plurality of people participating in a conversation, and environments that differ in sounds (silence, constant noise, retraining, and different voices), b) The second subscale is related to distance (spatial hearing) that evaluates matters such as lateralization, distance estimation and motion of the sound source, and the last main subscale is auditory quality, which examines things such as acoustic differentiation, recognition and auditory clarity [10] included 14, 17 and 19 questions, respectively [11]. This questionnaire (SSQ-49) is used as a supplement to other listening ability behavioral assessments. The framework is designed to assess communication abilities in hearing-impaired adults, particularly the elderly [10]. Speech, Spatial, and Qualities of Hearing Scale- 49 (SSQ-49) questionnaire test was developed to examine a person's functional abilities in different situations and environments; this test evaluates the overall view of different aspects of hearing and cognitive and hearing loss and its effects on different aspects of communication. Since the above-mentioned questionnaire is long and it takes time to fill it out, Noble et al. developed a shorter version of the Speech, Spatial, and Qualities of Hearing Scale- 49 (SSQ-49). In the summary version of the questionnaire, the same three previous domains were examined: speech, distance, and other auditory characteristics [11]. Different questionnaires were translated into the Persian language to evaluate the hearing aid function and its effect on improving hearing abilities and reducing the rate of disability in terms of hearing loss. Some of these questionnaires are International Outcome Inventory for Hearing Aids (IOI-HA), Glasgow Hearing-Aid Benefit Profile (GHABP) [12], Spatial hearing Questionnaire (SHQ) [13], etc. [14]. SSQ-12 questionnaire was quickly accepted in hearing clinics and among audiologists due to saving time and observing all standards of original questionnaire and quickly translated into different languages whole over the world [15]. This study aims to investigate the validity and reliability of the SSQ-12 questionnaire and to translate it into Persian for use in hearing aid performance evaluations for Persian-speaking hearing-impaired people.

Methods

Translation and Adaptation

This original research article was organized into two different aspects. Firstly, Persian version of SSQ-12 questionnaire has been translated. Secondly, field research was conducted to evaluate the reliability and validity of the Persian version. According to this, the authorization was taken from the authors of the Speech, Spatial, and Qualities of Hearing Scale 12 questionnaire (SSQ-12) for translation. The WHO method was used to translate the questionnaire into Persian. The questionnaire was translated from Persian to English by two translators who were both native Persian speakers and familiar with Audiology. The two translations were then combined and altered (Backward Translation). Then, three audiologists evaluated translation based on the observance of auditory cognitive characteristics of the original version. In the next part, two bilingual translators translated the

questionnaire from Persian to English. In the final step, the questionnaire is conceptually examined (Forward translation). The authors tried to keep the meaning of the original words and sentences clear. Utilizing the most appropriate words and concise questions to offer and preserve suitable meanings. In the final part of translation, the backward translation manuscript was compared to the original version. Any kinds of variations were detected and emendated. To assess Face validity, the questionnaire was given to five university students of different majors, and necessary rectifications were done based on the results Four skilled audiologists have investigated the questionnaire based on the "relevancy", "Simplicity" and "clarity" of each item (including questions and answers) to evaluate the content validity. "relevancy", "simplicity" and "clarity" answers to assess content validity. All scientific referees praised the content quality. (For all of the entries, the Content Validity Index (CVI) value was 100 percent.) Lawshe test was used to do statistical analysis of the findings. Finally, the Persian version with an appropriate and satisfactory translation of the SSQ-12 questionnaire was presented to 99 hearing voluntarily aids users.

All patients participated in this study of their desire and signed the consent form with full knowledge and trust. This study was carried out in strict accordance with the recommendations of the Nursing, Rehabilitation and Management Schools-Isfahan University of Medical Science's subcategory of the Iranian National Committee for Ethics in Biomedical Research by approval number of IR.MUI.RESEARCH.REC.13769. The mean age of participants was 36.263 years (SD=6.9143), with 45.5% female (45 individuals) and 54.5 % (54 individuals) whose hearing thresholds were measured recently. Information regarding the purpose of the study was given to all participants, and they have completed the questionnaire under the observation of a trained audiologist willingly.

- The inclusion criteria of this study were: hearing aid users with hearing loss range between Mild (thresholds≥25 dB HL to 40 dB HL) and Profound (thresholds≥90 dB HL) of sensorineural hearing loss type without any neurological conditions
- The exclusion criteria were: Any individual with normal hearing, patients with Neurological disorders, Unwillingness of patients to cooperate and participate in the research plan at each stage, Inability to complete the questionnaire for reasons such as insufficient concentration, any middle ear disorders

Measurement of hearing thresholds and demographic information was performed in audiology clinics. The patients were requested to complete the questionnaire again after one month to examine test-retest reliability using a Paired Sample t-test (the first attempt is shown and the second examination are shown with b in the tables). To assess the internal consistency of items, the Cronbach's Alpha coefficient correlation test was used. According to the international standards, the acceptable limit for the mentioned test is higher than 0.7.

Results

99 hearing-impaired individuals who use hearing aids unilaterally (11 persons) or bilaterally (88 persons) cooperated. The mean pure tone of right ears thresholds of participants was 54.5 dB (Standard Deviation=24.5 dB) and the mean pure tone thresholds of left ears of subjects were 52 dB (Standard Deviation=20 dB). The reliability was assessed using a paired sample t-test. As paired variables, 12 items from the questionnaire were chosen.

The results of the mean score of patients answering the questions of the questionnaire were obtained (q-b: before). Then, the results of the patients' response scores were re-recorded after one month (q-a: after). In the next step, the response score was compared using paired t-analysis to determine whether there was any change in the score of each question (Table 1). As can be seen

Table 1: Couple of t-test to assess the difference between pre-test and post-test mean scores results in patients.

Items		Mean	Std. Deviation	t	Sigma
Pair 1	q1b	2.838	0.8888	-33.604	<0.001
	q1a	6.192	0.8652		
Pair 2	q2b	2.576	0.9486	-38.549	<0.001
	q2a	6.586	0.9690		
Pair 3	q3b	2.727	0.8058	-37.940	<0.001
	q3a	6.455	0.7989		
Pair 4	q4b	2.717	1.1432	-34.396	<0.001
	q4a	6.222	0.7634		
Pair 5	q5b	2.717	0.8335	-39.882	<0.001
	q5a	6.586	0.7561		
Pair 6	q6b	2.899	0.8390	-43.381	<0.001
	q6a	6.515	0.7195		
Pair 7	q7b	2.545	0.8116	-48.323	<0.001
	q7a	6.869	0.8995		
Pair 8	q8b	2.717	0.6234	-43.434	<0.001
	q8a	6.606	0.9127		
Pair 9	q9b	2.859	0.8923	-36.766	<0.001
	q9a	6.495	0.8964		
Pair 10	q10b	2.667	0.8806	-49.925	<0.001
	q10a	6.828	0.8694		
Pair 11	q11b	2.949	0.9299	-41.349	<0.001
	q11a	6.768	0.8551		
Pair 12	q12b	2.606	0.7801	-44.973	<0.001
	q12a	7.040	0.7412		

Table 2: Pearson correlation coefficient table for couples of variables

		Number of individuals	Correlation	Sigma
Pair 1	q1b and q1a	99	0.359	<0.001
Pair 2	q2b and q2a	99	0.417	<0.001
Pair 3	q3b and q3a	99	0.258	<0.010
Pair 4	q4b and q4a	99	0.494	<0.001
Pair 5	q5b and q5a	99	0.266	<0.008
Pair 6	q6b and q6a	99	0.442	<0.001
Pair 7	q7b and q7a	99	0.463	<0.001
Pair 8	q8b and q8a	99	0.376	<0.001
Pair 9	q9b and q9a	99	0.395	<0.001
Pair 10	q10b and q10a	99	0.551	<0.001
Pair 11	q11b and q11a	99	0.473	<0.001
Pair 12	q12b and q12a	99	0.169	<0.094

Table 3: Internal consistency and reliability of test-retest of SSQ-12 questionnaire.

Reliability Statistics			Reliability Statistics after one month		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of Items	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of Items
0.924	0.927	12	0.867	0.868	12

in Table 1, the response scores of patients in the second state (answering after one month) the initial response ratio in all questions has decreased and this decrease is statistically significant (P<0.001).

The correlation coefficient between couples of variables was accurately evaluated using Pearson Correlation Coefficient in Table 2. (Pearson correlation coefficient changes between -1 and 1. When the correlation coefficient is positive, it indicates a direct link between variables; when it is negative, it suggests an inverse relationship between variables; and when the correlation coefficient is zero, it indicates that there is no linear relationship between the two variables).The positive values were significant, considering the closeness of zero values in Sigma votes for the existence of dependency among the pairs of variables.

Table 3 shows the inner consistency and reliability of the test-retest and scales of SSQ-12 questionnaire. The results of this Test manifested that has appropriate internal consistency (Cronbach's Alpha result: 0.924). The reliability of test-retest after one month was done and the total statistical scale results were 0.867.

Discussion

One of the most important aspects of improving rehabilitation programs and services for hearing-impaired people is evaluating the benefit of hearing aid users. The SSQ-12 questionnaire is a condensed version of the SSQ-49 mother's questionnaire, which was reduced from 49 to 12 questions owing to the large amount of questions and time commitment. The following similar studies to the present study are stated to compare the results. Lotfi and his colleagues presented the Persian version of the SSQ-49 questionnaire and evaluated it in terms of validity and reliability. 333 adults (179 males and 121 females) with a mean age of 62 years were invited to complete the questionnaire. At first, the questionnaire was translated into Persian separately by three fluent audiologists in English and then a comprehensive questionnaire was presented. In the next step, a group of 20 psychologists, neurologists, linguists, and ENT specialists were evaluated for cultural conformity. The questionnaire was given to five hearing-impaired adults for responsiveness and finally, the final Persian version was evaluated and presented with the cooperation of an audiologist, linguist, and a group of researchers. Validity and reliability assessments showed a very close internal consistency among the questions (using Cronbach's Alpha instrumental criterion) and high test-retest reliability. In the present study and Lotfi study, high validity and reliability and high internal validity were obtained for both questionnaires. The Persian version of the SSQ-49 exam contains widely established psychological features and is well suited to assessing hearing-impaired Iranians' communication ability. [10]. In another study have done by Lotfi et al., the Persian version of the SSQ-49 questionnaire (with three main subscales: speech perception, spatial hearing, and auditory quality) was used to evaluate the improvement of central hearing performance after dichotic exercises (binaural central exercises) to investigate the effects of aging on communication skills in adults with normal peripheral hearing. All patients in this study (n=32, 16 males and 16 females, mean age: 68.18 and SD=6.20) had normal peripheral hearing (mean pure tone thresholds≤db25) and normal middle ear function (type A tympanogram and normal acoustic reflex results). The difficulty to interpret sound in contexts with background noise, such as public places where it is difficult to understand other people's speech or when a group of people talks at the same time, was the most prevalent complaint of patients in this research. The theory discussed by the researchers of this project is the lack of coordination of inter-hemisphere information transfer (especially the corpus callosum, which is analyzed and functionally reduced from the age of 55 to 60). Dichotic tests examine the correct function of transferring information between hemispheres. All adults in this experiment showed binaural asymmetry in dichotic tests. This study's results indicate that scores of three main subscales of the SSQ test (subscale of hearing quality with the lowest score) and the final score of the

overall test decrease with increasing age. However, by dichotic exercises, the results of the SSQ test for all three main subscales (the highest score for the speech perception subscale and the lowest score for the spatial auditory subscale) increase. The results of this research show that dichotic examinations enhance auditory attentional function and central processing, leading to a rise in the quality of communication skills. This study was done using the SSQ-49 test, according to the idea of the researchers of this project, the SSQ-12 test can be used to evaluate binaural functions after dichotic rehabilitation methods, which requires another study. Gonzalez et al. conducted a study of 30 adults (12 males and 18 females) aged between 18 and 89 to assess the validity and reliability and ability of SSQ-12 Brazilian version. 15 people with hearing in the normal range and 15 others had hearing loss. The test results show a very high internal consistency among the questions proportional to Cronbach's Alpha statistical measurements and its high ability to differentiate the performance of hearing-impaired patients and identify the limitations of hearing loss throughout the daily life of them. This study's researchers are encouraged to utilize this test to assess the improvement in performance of hearing-impaired patients who have started using hearing aids and to track the influence of hearing aids on hearing function in daily life [16]. With greater health and longer life expectancy, we have seen a rise in the number of older individuals in recent years. The series of problems that occur to elderly people include presbycusis. Currently, the only solution provided to solve this problem is to use hearing aids. Therefore, there's a need for a way to understand the problem of people using hearing aids. Finding qualified people to participate in this study, appropriate cooperation of samples and the time spent translating and preparing the questionnaire to present to the participants were limitations of this study that authors were facing.

Conclusion

Questionnaires are successful self-report tools to assess the effect of hearing aids on the improvement of disability. SSQ-12 questionnaire is one of the most often used in hearing clinics and hearing aid research labs. In this research, we attempted to construct a Persian version of the SSQ-12 questionnaire that could be utilized as a rapid and thorough instrument to determine a person's hearing aid status. According to statistics of this study, SSQ-12 has high internal consistency reliability, and validity. Finally, the Persian version of the SSQ-12 questionnaire is a valid and accurate tool for measuring audiological properties and can be used for research and clinical purposes.

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Conflict of Interest: None declared.

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