

YAYIN BİLGİSİ

The Validity and Reliability of the Auditory Localization Scale in the Turkish Population

Bünyamin ÇILDIR

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Objective: Our study aimed to make the Turkish version of the Auditory Localization Skills Questionnaire valid and reliable. **Materials and Methods:** This study included 140 individuals (70 male and 70 female) with normal hearing and 158 individuals (78 male and 80 female) with sensorineural hearing loss in both ears. The Auditory Localization Skills Questionnaire and the Speech, Spatial, and Qualities of Hearing Scale (SSQ) were sent to the participants by e-mail via Google Survey, and filled in. Internal consistency and reliability were evaluated with Cronbach's alpha. To determine the accuracy of the questionnaire findings, 20% of the participants were retested. In order to evaluate the reliability of the auditory localization skills questionnaire, a correlation was made with the SSQ. **Results:** Internal consistency, according to Cronbach's Alpha values of the Auditory Localization Skills Questionnaire, were found to be high, both for individuals with normal hearing ($\alpha = 93.4$) and individuals with hearing loss ($\alpha = 91.8$). The sub-scale scores of the auditory localization skills questionnaire were found to be lower (better) in individuals with normal hearing than in individuals with hearing loss. **Conclusion:** The Turkish version of the auditory localization skills questionnaire is a valid and reliable questionnaire that evaluates the psychological effects as well as the spatial effects of hearing in individuals with hearing loss and normal hearing. Cite this article as: Çıldır B. The validity and reliability of the auditory localization scale in the turkish population. Arch Health Sci Res. 2022; 9(1): 32-37.

Anahtar kelimeler: hearing loss, localization, validity and reliability



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Bünyamin ÇILDIR 

Department of Language and Speech Therapy, Ankara Yıldırım Beyazıt University, Faculty of Health Sciences, Ankara, Turkey

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ABSTRACT

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Materials and Methods: This study included 140 individuals (70 male and 70 female) with normal hearing and 158 individuals (78 male and 80 female) with sensorineural hearing loss in both ears. The Auditory Localization Skills Questionnaire and the Speech, Spatial, and Qualities of Hearing Scale (SSQ) were sent to the participants by e-mail via Google Survey, and filled in. Internal consistency and reliability were evaluated with Cronbach's alpha. To determine the accuracy of the questionnaire findings, 20% of the participants were retested. In order to evaluate the reliability of the auditory localization skills questionnaire, a correlation was made with the SSQ.

Results: Internal consistency, according to Cronbach's Alpha values of the Auditory Localization Skills Questionnaire, were found to be high, both for individuals with normal hearing ($\alpha=93.4$) and individuals with hearing loss ($\alpha=91.8$). The sub-scale scores of the auditory localization skills questionnaire were found to be lower (better) in individuals with normal hearing than in individuals with hearing loss.

Conclusion: The Turkish version of the auditory localization skills questionnaire is a valid and reliable questionnaire that evaluates the psychological effects as well as the spatial effects of hearing in individuals with hearing loss and normal hearing.

Keywords: hearing loss, localization, validity and reliability

Introduction

The auditory system is the most basic sensory system of communication that provides information about various environments. Therefore, hearing plays an important role, both in distinguishing complex speech stimuli in noisy environments and in the localization of acoustic stimuli.¹ Auditory localization is defined as the perception and interpretation of spatial cues after the interaction of sound waves directed from the sound source, with the ear and head regions.² This ensures that sounds are heard more naturally and comfortably.³ Individuals with both ears at the limit of normal hearing use various acoustic cues, such as interaural time and level-difference clues, to locate a sound source.⁴ Individuals with hearing loss have difficulty in determining the location of the incoming signal in space, compared to individuals with normal hearing, since they do not perceive the differences in intensity and time between the ears when noise and speech stimuli come from different locations.⁵ Impaired spatial hearing perception can cause a decrease in speech discrimination, auditory processing, and cognitive skills in noise, both in individuals with hearing loss and those with normal hearing.⁶⁻⁸

The spatial processing of hearing is a complex process. Since it is significant in the evaluation of hearing loss, there are deficiencies in the content of the test batteries developed in the evaluation of this disorder. For this reason, scales such as the Speech, Spatial, and Qualities of Hearing Questionnaire (SSQ) and the Spatial Hearing Questionnaire (SHQ) have been developed to evaluate spatial hearing in general. Although both of these scales are related to the ability to distinguish speech in noisy and quiet situations, there is no questionnaire that evaluates only the spatial aspects and psychological effects of hearing in different situations.⁹ Although some of the questions in the auditory localization scale are included

Corresponding author: Bünyamin ÇILDIR, e-mail: bunyamin.cildir@gmail.com; bcildir@ybu.edu.tr



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in the SSQ and the SHQ, there are questions evaluating the psychological aspects of hearing in the auditory localization scale, unlike in other questionnaires.^{3,10-12}

Our study aimed to make the Turkish version of the auditory localization questionnaire valid and reliable for use in evaluating individuals with normal hearing and individuals with hearing loss, to meet the lack of an appropriate scale to evaluate the auditory localization skills and to ensure the rapid and reliable measurement of the patients' spatial hearing skills.

Materials and Methods

This study was approved by Ankara Yıldırım Beyazıt University Ethics Committee (Date: July 9, 2020; Code number: 57) and it was implemented in accordance with the principles outlined in the Declaration of Helsinki. Consent was obtained from all individuals with an informed consent form. Before starting the study, the necessary permission was obtained to translate the questionnaire.

Participants

The hearing localization scale that we applied in our study was administered through the Google questionnaire, and the informed consent forms were sent to the patients by e-mail and signed, and then received in return by mail. Our study included 140 individuals (70 female and 70 male) with normal hearing, between the ages of 18 and 45 (mean 27.83 ± 10 years), and 158 individuals (80 female and 78 male) between the ages of 18 and 45 (mean age 30.41 ± 9.01 years) with sensorineural hearing loss. The descriptive characteristics of the individuals participating in the study are shown in Table 1. Individuals whose native language was Turkish and who could answer all the questions, and had no neurological disorder, were included in our study. While 27 individuals with normal hearing had a high-school education, all of the other participants (113) were university students or graduates. Out of the group of study participants with hearing loss, 8 individuals were educated at the secondary-school level, 19 individuals were high-school graduates, and the remaining 131 individuals were university graduates. All of our participants were contacted via Zoom and the sections specified in the informed consent form were explained. Thirty-four of the individuals with sensorineural hearing loss reported using hearing aids. Only 6 of these 34 individuals reported using hearing aids in both ears, while the others used single-sided hearing aids. The average hearing aid usage period was 23.7 ± 11 months. Localization skills were evaluated for all participants without hearing aids. In our study, 154 participants with normal hearing and 271 participants with hearing loss were reached, but only 140 individuals with normal hearing and 158 individuals with hearing loss agreed to participate in the study. Before starting our study, a preliminary study was done, which identified individuals with severe to profound hearing loss; they were not included in the study because they could not mark most of their scores in the auditory localization questionnaire without a hearing aid. Participants were divided into 4 groups according to the degree of hearing loss: normal hearing (0-25 dB HL), mild (26-40 dB HL), moderate (41-55 dB HL), and moderate-severe (56-70 dB HL) sensorineural hearing loss (Weinstein and Ventry, 1982). Individuals with hearing loss who participated in our study were recruited from the patients who

applied to the hearing center for hearing aids. Each of the participants was required to provide air (at 125-8000 Hz octave frequencies) and bone conduction (at 500-4000 Hz octave frequencies) hearing threshold measurements for both ears, obtained in a sound-treated booth in the preceding 6 months. The pure-tone average of each ear was calculated by taking the arithmetic average of the hearing thresholds at frequencies of 500, 1000, 2000, and 4000 Hz.

Turkish Auditory Localization Scale

The auditory localization scale developed by Neelamegarajan et al³ was used to determine and define the localization of stimuli in noisy and silent environments depending on the psychological and social conditions of individuals.³ While developing the original form of the auditory localization questionnaire, the SSQ and the SHQ data were used.^{3,11} The Turkish version of the auditory localization scale consists of 4 subsections: 5 questions related to traffic-heavy areas, 4 questions related to the outdoor environment, 2 questions regarding the indoor environment and situations in the immediate environment, and 13 questions related to the psychological aspects of hearing. It is scored between 1 and 5, as 1= never; 2=almost never; 3= sometimes; 4=almost always; and 5=always. The questionnaire contains 15 questions on localization in noisy environments, and 7 questions on localization in quiet environments. While the high scores indicate that individuals face hearing difficulties in the specified situations, the low scores indicate that they have good hearing in the specified situations. The back-translation method was used in the adaptation of the Turkish auditory localization scale. It was translated from English to Turkish by a professional translator and then translated from Turkish to English by another professional translator. The final version of the questionnaire was controlled by a bilingual field specialist (an expert audiologist), and after the final controls, the necessary changes were made and the final version (given in Annex 1) was developed.

Statistical Analysis

Statistical analysis was performed using the SPSS 23.0 statistical package program (IBM SPSS Corp., Armonk, NY, USA). The Kolmogorov-Smirnov test was used to evaluate the normality assumptions of the data. Descriptive statistical analyses were evaluated by taking the mean scores of the Turkish auditory localization scale. Before performing factor analysis, the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity (BTS) were measured for the sample size. For the factor analysis of the auditory localization scale, Cronbach's alpha and item-total correlations were measured by evaluating the internal consistency. Eigenvalues and box graph curves were used to determine factors with high correlation in the auditory localization scale items, and those with eigenvalues greater than 1 were evaluated.¹³ Correlation between the varimax rotation auditory localization scale scores for each subtest was set based on the Pearson's correlation coefficient. The independent *t*-test and correlation analysis were performed to compare independent variables. One-way ANOVA was used to determine the differences in the Turkish auditory localization scale scores among the 4 groups. Hedges' effect size was calculated in the comparison between the 2 groups, and the correction factor was not used because of the effect size between the mean values of the group was high. The level of significance was accepted as 0.05 (5%).

Table 1. Descriptive Properties of the Participants

Degree of Hearing Loss	N (%)	Female/Male	Age (Years)	Right PTA (dB HL)	Left PTA (dB HL)	SD Scores Right/Left (%)
Normal	140 (46.9)	70/70	18-45 (27.83±10)	9.4 ± 12.1	11.5±10.7	98/96.4
Mild	50 (16.7)	25/25	18-45 (27.68 ± 2.7)	31.8 ± 7.5	30.1±5.8	89.1/88.4
Moderate	56 (18.8)	28/28	18-45 (33.41 ± 7.9)	52.7 ± 8.2	53±6.4	83.5/84.2
Mod-Severe	52 (17.44)	27/25	18-45 (29.8 ± 6.1)	61.1 ± 7.9	59.5±10.3	80.5/82.6

Mod-Severe, moderate-severe hearing loss; SD score, speech discrimination score.

Results

The pure-tone mean of the participants' test results was found as 12 ± 0.4 dB HL for individuals with normal hearing, 33.4 ± 6.8 dB HL for individuals with mild hearing loss, 50 ± 3.7 dB HL for individuals with moderate hearing loss, and 65 ± 2.4 dB HL for individuals with moderate to severe hearing loss. It was found that 86 participants with hearing loss had high-frequency hearing loss, 59 participants had flat-type hearing loss, and 13 participants had low-frequency hearing loss.

There was no statistical difference between the average scores of the Turkish version of the auditory localization scale according to the gender differences of each group, as predicted ($P > .05$).

Psychometric Values

The average total scores of the Turkish auditory localization scale of the 4 groups (normal hearing, and mild, moderate, and severe hearing loss) are shown in Table 2. For individuals with normal hearing ($N=140$), the KMO score was 0.90 and the result of BTS was $\chi^2=1999.4$, $df=276$, and $P=.001$. For individuals with hearing loss ($N=157$), the KMO score was 0.84 and the result of BTS was found to be $\chi^2=3457$, $df=256$, $P=.001$. According to these results, the data we obtained for the Turkish auditory localization scale are suitable for factor analysis.

The x -axis graph (scree plot) and eigenvalues of the factor were examined to determine the number of factors.

In individuals with normal hearing, 5 eigenvalues greater than 1 were found and the first factor was 42.5% of the total variance (eigenvalue=10.2), the second factor was 9.1% of the total variance (eigenvalue=2.2), the third factor was 4.9% of the total variance (eigenvalue=1.1), the fourth factor was 4.2% of the total variance (eigenvalue=1), and the fifth factor was 4.2% of the total variance (eigenvalue=1.1).

For the Turkish auditory localization scale in individuals with normal hearing, the first factor is out of 7 questions (1, 2, 7, 16, 18, 20, and 23) related to traffic noise and localization in a silent environment; the second factor is from 5 questions related to traffic and external noise (3, 4, 5, 6, and 15); the third factor consists of 4 questions related to localization and the psychological aspects of hearing (13, 14, 20, and 21); the fourth factor is from 5 questions related to interior spaces, outdoor spaces, and localization (8, 10, 14, 22, and 24); and the fifth factor consists of 2 questions (12 and 17) related to localization and the psychological aspects of hearing.

Individuals with hearing loss had 5 eigenvalues greater than 1, and the first factor was 43.1% of the total variance (eigenvalue=11.3);

Table 2. Mean and Standard Deviation of the Auditory Localization Scale

Questions	Group I		Group II		Group III		Group IV		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Traffic zone	A1	1.8	1.0	2.7	1.7	2.2	0.8	2.2	1.2
	A2	1.9	0.9	3.1	1.1	2.2	0.9	2.1	1.1
	A3	2.9	1.1	2.1	1.5	3.8	0.8	3.2	1.2
	A4	2.3	1.0	2.4	1.3	3.7	0.8	2.8	1.3
	A5	2.4	1.1	2.5	2.1	3.7	0.8	2.9	1.4
Total A	11.3	4.0	12.8	3.5	15.5	3.6	13.3	4.7	
Outdoor situations	B1	2.5	1.2	2.9	1.2	2.7	0.7	3.6	1.5
	B2	2.0	1.1	2.6	1.2	2.5	0.8	2.4	1.3
	B3	2.2	1.1	2.1	0.5	2.2	0.6	2.4	1.1
	B4	1.7	0.9	2.4	1.3	2.1	0.7	2.2	1.2
Total B	8.5	3.3	10	2.7	9.5	2.1	10.6	4	
Indoor and near your locality	C1	1.8	1.0	2.1	1.3	1.9	0.6	2.4	1.5
	C2	2	1.0	2.8	1.3	1.8	0.6	2.4	1.2
Total C	3.8	1.7	4.9	1	3.7	1.1	4.8	2.3	
Psychological aspects	D1	2.6	1.3	2.2	0.6	2.7	0.8	2.9	1.5
	D2	3.4	1.2	2.6	1.5	2.8	0.9	3.7	1.5
	D3	2.3	1.2	2.1	0.5	1.4	0.6	2.4	1.6
	D4	3.2	1.2	3.7	1.7	2.7	1.0	3.3	1.3
Total D	11.5	3.6	10.6	3.1	9.5	2.6	12.1	4.6	
Localization in quiet situations	Q1	1.7	0.9	2.1	1.2	2.4	0.8	2.1	1.2
	Q2	2.3	1.1	2.4	1.7	2.4	0.8	2.6	1.6
	Q3	1.4	0.8	2	1.5	2.4	0.9	1.8	1.3
	Q4	1.6	0.9	2.4	1	1.5	0.6	1.8	1.2
	Q5	1.6	0.8	1.7	0.5	1.6	0.6	1.6	1.0
	Q6	1.5	0.8	1.7	1.3	1.6	0.6	1.6	0.9
	Q7	1.7	0.9	1.4	1.4	1.7	0.6	2.0	1.2
	Q8	1.6	0.8	1.6	2.4	1.7	0.6	2.2	1.2
	Q9	1.7	1.1	2.8	1.3	1.7	0.6	2.1	1.4
Total Q	15.4	1.61	18.1	1.2	16.9	1.1	17.8	1.5	
Overall Total	50.52	5.71	56.4	4.1	55.1	2.1	58.6	3.4	

The first 5 items of the Turkish auditory localization scale related to traffic noise are A1-A5, 4 items related to outdoor sounds are B1-B4, 2 items related to indoor sounds are C1-C2, four items related to psychological aspects are D1-D4, and 9 items related to localizations are indicated by Q1-Q9. Total A, traffic noise total score; Total B, outdoor subscale total score; Total C, indoor subscale total score; Total D, psychological aspects subscale total score; and Total Q, localization subscale total score in quiet environments. SD, standard deviation; Mean, average; Group I, individuals with normal hearing; Group II, Mild hearing loss; Group III, moderate hearing loss; Group IV, moderate to severe hearing loss.

the second factor was 12.6% of the total variance (eigenvalue=3.3); the third factor was 9.5% of the total variance (eigenvalue=2.7); the fourth factor was 7.1% of the total variance (eigenvalue=2.1); and the fifth factor was 4.7% of the total variance (eigenvalue=1.5).

The first factor for the Turkish auditory localization scale in individuals with hearing loss was traffic noise and outdoor noise, and 11 questions related to localization in a silent environment (1, 2, 6, 7, 8, 10, 14, 16, 18, 23, and 24); the second factor was 6 questions related to outdoor and indoor noise and the psychological aspect of hearing (5, 9, 11, 12, 13, and 22); the third factor was among the 3 questions related to localization (19, 20, and 21); and the fourth factor was related to localization in noise (traffic). The fifth factor consisted of a question related to the psychological aspects of hearing (15).

Validity and Reliability of Turkish Auditory Localization Scale

The reliability of the Turkish auditory localization scale was evaluated according to its internal consistency and its test-retest reliability. Internal consistency was evaluated with the coefficient Cronbach's alpha. The Cronbach's alpha value of the Turkish auditory localization scale was found to be 93.4 for those with normal hearing and 91.8 for those with hearing loss. The Cronbach's alpha value of the Turkish auditory localization scale was calculated and this value was found above the clinical usability level (0.7 critical value). These high α values indicate that the internal consistency and reliability of the questionnaire are good. The item-total correlation for individuals with normal hearing loss was between 0.70 and 0.98, while the item-total correlation for individuals with hearing loss was between 0.71 and 0.96 (Table 3).

For the retest reliability of the Turkish auditory localization scale, approximately 20% of the participants with hearing loss (n=35) and normal hearing (n=35) were asked to fill in the questionnaires one

Table 3. Item-Total Correlation for Each Item on the Turkish Auditory Localization Scale

Individuals with Normal Hearing		Individuals with Hearing Loss	
Item	Item-Total Correlation	Item	Item-Total Correlation
1	0.920	1	0.943
2	0.951	2	0.943
3	0.857	3	0.763
4	0.773	4	0.763
5	0.879	5	0.764
6	0.891	6	0.801
7	0.716	7	0.816
8	0.793	8	0.816
9	0.851	9	0.793
10	0.784	10	0.718
11	0.918	11	0.767
12	0.822	12	0.703
13	0.897	13	0.881
14	0.767	14	0.827
15	0.804	15	0.780
16	0.794	16	0.862
17	0.801	17	0.986
18	0.725	18	0.700
19	0.967	19	0.724
20	0.896	20	0.724
21	0.800	21	0.854
22	0.782	22	0.853
23	0.849	23	0.787
24	0.831	24	0.807

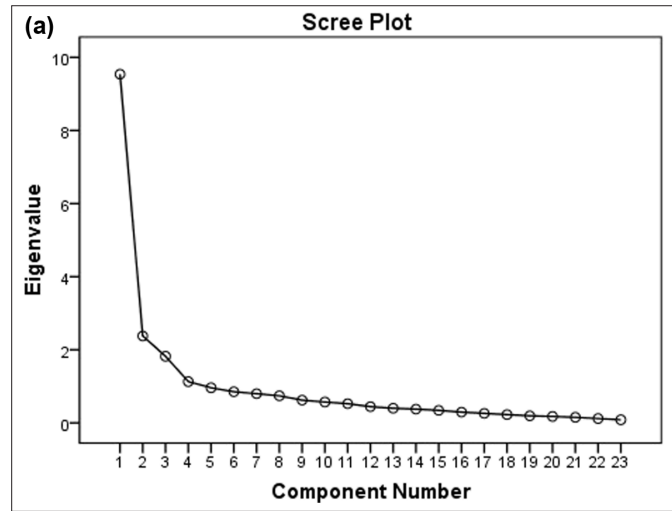


Figure 1. Box plot curve for the auditory localization skills questionnaire in individuals with normal hearing (Graphic A).

month later. In individuals with hearing loss (0.91, $P < .001$) and normal hearing (0.97, $P < .001$), the intraclass correlation coefficient was statistically significant. The item and total scores of the Turkish auditory localization scale for individuals with normal hearing and hearing loss are shown in the box graph in Figures 1 and 2.

Construct validity was evaluated by comparing the mean and standard deviation of the total and subtests of the Turkish auditory localization scale in 3 hearing-loss types (mild, moderate, and moderate-severe) and normal hearing. One-way ANOVA was used to display differences in scores of the Turkish auditory localization scale among the 4 groups. The Turkish auditory localization scale's mean scores differed significantly across the 4 groups ($F(3, 297) = 3.705, P < .012$). The auditory localization scale scores increased with increasing hearing loss. The minimum mean scores were obtained in individuals with normal hearing, and the maximum mean scores were obtained in those with severe hearing loss. In the Tukey post-hoc comparisons of the 4 groups, statistically significant differences were found between the total Turkish auditory localization scale scores of the normal hearing group and the hearing loss groups ($P < .001$). In addition, a statistically significant

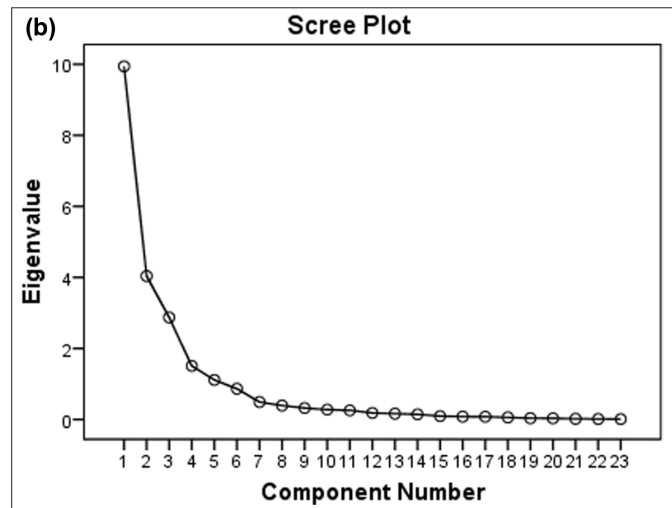


Figure 2. Box plot curve for the auditory localization skills questionnaire in individuals with hearing loss (Graphic B).

difference was observed between the total Hedge's effect size of the groups with moderate hearing loss and moderate-severe hearing loss ($P < .001$) (Table 4).

Comparison of the Auditory Localization Scale and Speech Discrimination Scores in Individuals with Hearing Loss

A statistically significant difference was observed between the traffic noise ($P = .019$) and the near-your-location subtest scores of individuals with moderate and moderate-to-severe hearing loss ($P = .001$). In addition, a statistically significant difference was found between the psychological aspects subtest scores of individuals with mild and moderate-to-severe hearing loss ($P = .001$).

A statistically high correlation was observed between the right ($r=0.897$, $P = .001$) and the left ear ($r=0.948$, $P = .001$) in speech discrimination scores and total auditory localization scores of individuals with mild hearing loss. No statistical correlation was observed between the right and left ear speech discrimination scores and the total auditory localization scores of individuals with moderate and moderate-to-severe hearing loss ($P > .05$). A moderate correlation was observed between the right ($r = 0.532$, $P = .016$) and left ear ($r=0.647$, $P = .021$) in speech discrimination and the total auditory localization scale scores of the individuals with normal hearing.

Discussion

The normal auditory system is capable of spatial separation of sound waves using various acoustic cues such as interaural time and level differences for the localization of a sound. Individuals with hearing loss have difficulty in the spatial separation of sounds due to distortion of these acoustic cues, especially in the presence of background noise. Our study aimed to evaluate the psychological effects of auditory localization skills in individuals with normal hearing and those with hearing loss in difficult listening situations such as noisy situations, as well as the psychological effects of hearing loss, and to ensure the validity and reliability of the auditory localization scale.

The value of the internal consistency coefficient, Cronbach's alpha, for the Turkish auditory localization scale was found to be 93.4 for those with normal hearing and 91.8 for those with hearing loss. A Cronbach's alpha value >0.70 in the questionnaire or scale used indicates that the questionnaire or scale is valid and reliable.¹⁴ The item-total correlation for individuals with normal hearing loss was between 0.70 and 0.98,

while the item-total correlation for individuals with hearing loss was between 0.71 and 0.96. There is no study in the literature on factor analysis of the auditory localization scale. Our study is unique in this respect. The number of factors was found to be 5, both in individuals with hearing loss and in those with normal hearing.

In our study, it was observed that the average auditory localization scale of individuals with normal hearing was the lowest, and the scale scores increased with the degree of arc hearing loss. Studies have indicated that individuals with hearing loss may have impaired skills in the perception of acoustic and spatial cues of sound.^{15,16} It has been reported that individuals with sensorineural hearing loss experience greater difficulty in locating the sound source in quiet environments or in a place with background noise, than do individuals with normal hearing.¹⁷ In our study, the fact that the auditory localization scores of individuals with normal hearing and mild bilateral sensorineural hearing loss were lower than the scores of individuals with moderate to moderate-severe hearing loss in different situations such as traffic noise and indoor or outdoor hearing loss, and the interaural level and time difference clues to improve the speech understanding skills of these individuals, have shown that it can use much better. However, the differences in localization skills in all individuals with hearing loss compared to the normal group prompted the idea that the perception of these acoustic cues might be impaired. In a study, it was stated that individuals with normal hearing had better perception of spectral cues of auditory level difference and auditory time difference stimuli compared to individuals with hearing loss.^{3,15}

In our study, the psychological subscale scores of individuals with moderate hearing loss were found to be lower than those of the other groups according to the subtypes of the auditory localization scale. In a study conducted by Neelamegarajan et al.³ the psychological impact subscale scores of individuals with hearing loss were found to be higher than for those with normal hearing.³ This difference in our study was thought to be due to individual differences.

In studies conducted with individuals with hearing loss, it has been reported that with assistive equipment such as hearing aids or cochlear implants, improvements can be observed in both auditory localization skills and speech discrimination scores in noise.¹⁸⁻²⁰ In our study, the high correlation between auditory localization skill scores and speech discrimination scores of individuals with mild sensorineural hearing loss, which has not been observed in those with moderate and moderate-severe hearing losses, suggested that the perception of localization may be impaired by hearing loss.

In our study, significant differences were observed between the psychological aspects of the auditory localization subtests, especially in individuals with mild and moderate sensorineural hearing loss, indicating that the psychological perception of individuals may deteriorate with the increase in hearing loss. It has been stated that psychological disorders may be associated with auditory and vestibular symptoms such as tinnitus, balance disorder, and hearing loss.^{21,22}

Limitations

This study is limited to the evaluation of individuals with varying degrees of sensorineural hearing loss and cannot be generalized to other hearing impairments (such as asymmetric, mixed, or conductive hearing losses). Although the number of individuals participating in our study was sufficient, the findings should be interpreted very carefully, since the socio-economic status of the individuals was not evaluated. Information about the duration and etiology of the patients' hearing loss was not obtained from the participants, and no evaluation could be made according to the duration of hearing loss. Despite

Table 4. Tukey's Post-Hoc Comparisons of Turkish Auditory Localization Scale Scores in the 3 Hearing Loss Groups and the Normal Hearing Group

Groups	Mean Difference	Standard Error	P
Normal			
Mild	-3.784	0.675	<.001
Moderate	-4.421	0.648	<.001
Mod-Severe	-1.910	0.665	<.023
Mild			
Normal	3.784	0.675	<.001
Moderate	-0.637	0.797	>.855
Mod-Severe	1.873	0.812	>.099
Moderate			
Normal	4.421	0.648	<.001
Mild	0.637	0.797	>.855
Mod-Severe	2.510	0.789	<.009
Mod-Severe			
Normal	1.910	0.665	<.023
Mild	-1.873	0.812	>.099
Moderate	-2.510	0.789	<.009

Mod-Severe, moderate-severe hearing loss.

these limitations, it can help doctors or audiologists to better assess patients' localization skills in a valid and reliable way.

Conclusion

The auditory localization questionnaire is a valid, reliable, and useful questionnaire for evaluating the localization skills of individuals with normal hearing and with different degrees of hearing loss. Since the application of the scale can be completed in only 5 minutes, it can be applied to Turkish-speaking individuals in the assessment of hearing skills under many different situations, especially in intense clinical conditions, and the auditory rehabilitation process to be given can be determined.

Ethics Committee Approval: Ethics committee approval was received for this study from the Ethics Committee of Ankara Yıldırım Beyazıt University (Date: July 9, 2020; Code number: 57).

Informed Consent: Written consent was obtained from the participants.

Peer Review: Externally peer-reviewed.

Conflict of Interest: The author have no conflict of interest to declare.

Financial Disclosure: The author declared that this study has received no financial support.

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Türkçe İşitsel Lokalizasyon Ölçeği

Yaş/Cinsiyet:

Eğitim :

Dosya no :

İşitme cihazı/yönü :

Yönerge: Soruları okuyun ve soru ile ilişkili sütunu işaretleyerek seçiminizi belirtin.

	Gürültülü durumlarda lokalizasyon	Hiçbir zaman	Nadiren	Ara sıra	Çoğu zaman	Her zaman
A. Trafik gürültüsünde						
1.	Yoğun bir caddenin kaldırımında durduğunuzda (bir otobüs, kamyon veya herhangi bir aracı görmeden) gelen aracın hangi yönden veya yandan geldiğini söylemekte zorluk çeker misiniz?					
2.	Yoğun bir caddede kaldırımında durduğunuzda, bir otobüsün veya kamyonun sesinden onun ne kadar uzakta olduğunu söylemekte zorluk çeker misiniz?					
3.	Başınızda kask takılı ve mobilet kullanırken, arkanızda oturan kişinin ne söylediğini duymakta zorlanır mısınız?					
4.	Başınızda kask takılı ve mobilet kullanırken, ambulans sesinin hangi taraftan geldiğini belirlemede zorluk çeker misiniz?					
5.	Mobilet (basınızda kask varken) veya pencereleri kapalı dört tekerlekli bir araç sürerken, başka bir aracın sesinin hangi taraftan geldiğini bulmakta zorluk çeker misiniz?					
B. Dış mekânlarda						
1.	Dışarıdasınız. Bir uçak sesi duyuyorsunuz. Sadece uçağın sesini duyarak gökyüzünde nerede olduğunu söylemekte zorlanır mısınız?					
2.	Dışarda (açık havada) tanımadığınız bir yerdesiniz. Havlayan bir köpeğin sesini duyuyorsunuz, fakat onun nerede olduğunu göremiyorsunuz. Bakmadan köpeğin nerede olduğunu söylemekte zorlanır mısınız?					
3.	Sokakta, yürüyen yayaları duyuyorsunuz. Ayak seslerini duyarak sesin geldiği yönü belirlemede zorlanır mısınız?					
4.	Çalan orkestra veya bir müzik gurubunu görmeden, müzik kaynağının yerini belirlemede zorluk çeker misiniz?					
C. İç mekânda ve bulunduğunuz yere yakın						
1.	Evinizde TV izlerken, rüzgâr nedeniyle kapının çarptığını duyduğunuzda, hangi kapının olduğunu tespit etmekte zorluk çeker misiniz?					
2.	Yüksek katlı bir dairede veya bir bina / balkon / köprünün ikinci katındasınız. Başka bir kattan veya zemin kattan ses duyuyorsunuz. Sesin yukarı kattan mı yoksa aşağı kattan mı geldiğini söylemekte zorlanır mısınız?					
D. Psikolojik Yönleri						
1.	Yönünüzü bulmakta zorluk çekmeniz nedeniyle yabancı bir yerde gergin oluyor musunuz?					
2.	Gürültülü alanlar gibi kalabalık alanlardan kaçınıyor musunuz?					
3.	Pazar yerlerinde yalnız alışveriş yapmaktan kaçınıyor musunuz?					
4.	Karmaşık sesler geldiğinde konsantrasyonunuzu kaybediyor musunuz?					
Sessiz durumlarda lokalizasyon						
1.	Sessiz bir odada göremediğiniz biri size yüksek sesle bağırdığında yanlış yöne dönüyor musunuz?					
2.	Bilmediğiniz sessiz bir evdesiniz. Kapının çarptığını duydunuz. Sesin geldiği kapıyı belirlemede zorlanır mısınız?					
3.	İki kişi arasında oturuyorsunuz. İkisinden biri konuşmaya başlıyor. Konuşan kişiye bakmadan o kişinin solunuzda mı yoksa sağınızda mı olduğunu belirlemede zorlanır mısınız?					
4.	Sessiz bir odada erkek sesinin yönünü onu görmeden belirlemede zorluk çeker misiniz?					
5.	Sessiz bir odada kadın sesinin yönünü onu görmeden belirlemede zorluk çeker misiniz?					
6.	Sessiz bir odada çocuk sesinin yönünü onu görmeden belirlemede zorluk çeker misiniz?					
7.	Başka insanların olduğu bir evde sessiz bir odadasınız. Bu kişiler farklı bir odada konuşuyorlar ve siz onları duyabiliyorsunuz. Bu insanların evin hangi bölümünde bulunduğunu söylemekte zorlanır mısınız?					
8.	Sessiz bir odadasınız ve cep telefonunuz sizden belirli bir mesafe uzaklıkta çalıyor. Telefonun zil sesini duyarak telefonunuza ulaşmakta zorluk çeker misiniz?					
9.	Evinizde odalardan birinde açık bir musluktan akan su sesi duyuyorsunuz. Açık musluğu bulmakta zorlanır mısınız?					

BENZER YAYINLAR



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