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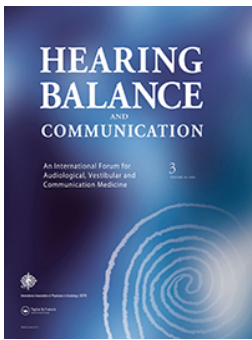
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ORIGINAL ARTICLE

Translation, validity, and reliability of the Persian version of the University of Cincinnati Auditory Processing Inventory

Fereshteh Bagheri[a] , Robert W. Keith[b,c], Abbas Ebadi[d], Masoumeh Eshaghi[a], Motahareh Shirzad[a] and Akram Ahmadi[e]

[a]Department of Audiology, School of Rehabilitation Sciences, Babol University of Medical Sciences, Babol, Mazandaran, Iran; [b]Department of Otolaryngology, University of Cincinnati College of Medicine, Cincinnati, OH, USA; [c]Department of Communication Sciences and Disorders, University of Cincinnati, Cincinnati, OH, USA; [d]Behavioral Sciences Research Center, Life Style Institute, Faculty of Nursing, Baqiyatallah University of Medical Sciences, Tehran, Iran; [e]Department of Speech therapy, School of Rehabilitation Sciences, Babol University of Medical Sciences, Babol, I.R. Iran

ABSTRACT

Background: Cincinnati Auditory Processing Inventory is used to examine difficulties with listening abilities among adolescents and adult groups and to investigate necessary skills for accurate processing of auditory information. This study aimed to develop the Persian version of the University of Cincinnati Auditory Processing Inventory (P-UCAPI) questionnaire.

Methods: A methodological and cross-sectional study was conducted on 121 adolescents and adults with normal auditory skills in the age range of 13- to 53-year-old in Babol city in Iran. The translation procedure was preceded according to World Health Organization (WHO). Then, item analysis, face validity, test–retest, and internal consistency were calculated. The descriptive statistics of the total score of the P-UCAPI and its subscales (listening and concentrating, understanding speech, following spoken instruction, attention, educational assistance, and other) were measured. In addition, the performance of males and females on this questionnaire was compared. The level of significance was established at ($p<.05$).

Results: A panel including two speech pathologists and one audiologist performed the content validity of the P-UCAPI and reached a consensus on all the items of the questionnaire. To investigate the need for item reduction, a Cronbach's alpha coefficient did not change with removing of each item so, none of the items were eliminated. The mean value and standard deviation of the participants for the total scores of the P-UCAPI were obtained at 53.04 ± 10.77. The mean values and standard deviations of subscales of the P-UCAPI were: listening and concentrating (13.51 ± 4.89), understanding speech (5.77 ± 1.73), following spoken instruction ($5.74 \pm .0$), attention (8.70 ± 1.24), education assistance (5.68 ± 1.85), and other (13.98 ± 3.84). Males and females had similar performance on P-UCAPI (p-value$=.16$) and its subscale including listening and concentrating (p-value$=.24$), understanding speech (p-value$=.60$), following spoken instruction (p-value$=.77$), attention (p-value$=.96$), education assistance (p-value$=.71$), and other (p-value$=.72$). The findings of the item analysis revealed that the value of Cronbach's alpha coefficient was not obtained higher than .83 after deleting each item. The value of ICC for test–retest reliability of P-UCAPI was .62 ranging from .38 to .85. For the internal consistency, the value of the alpha coefficient value was ($\alpha=.82$).

Conclusion: P-UCAPI as a translated instrument with satisfactory values for reliability is appropriate to measure the central processing skills of normal adults in Iran.

Introduction

The role of the peripheral auditory system is receiving and translating auditory signals and sending them to the higher auditory centres (bottom-up mechanisms). Auditory signal processing in the central auditory system leads to top-down mechanisms of perception [1]. The peripheral and central auditory systems interplay with each other. While normal hearing plays a crucial role in speech perception abilities, in some people despite having normal hearing, impaired speech perception is observed. Central auditory processing disorder (CAPD) is considered a neurodevelopmental disorder with a reported prevalence ranging from 2% to 7% [2–4]. The prevalence of this disorder in adults aged 55 and older was reported to range from 23 to 76% [5–7].

CAPD has negative effects on the psychosocial performance and quality of life of individuals suffering

from it. Difficulties in speech perception, especially in crowded and noisy environments, cause withdrawal from family gatherings and communicating with others [8,9]. The reasons for degraded performance in noise are thought to be from decreased concentration on the target stimulus and weak capacity of short-term working memory [10–12]. Consequently, individuals depend more depend on visual more than auditory information [1,13]. Furthermore, other challenges with CAPD are a deficit in academic abilities such as reading and writing [14]. Listening ability is considered a functioning skill that involves several skills such as sensing and attending, understanding and interpreting, remembering, and responding [15]. Listening ability has an important effect on the development of language and children who are poor listeners typically have poorer language skills than typical children [16]. Listening under challenging situations is called listening effort (LE) or mental effort that has negative effects on mental health and is a manifest feature of people with CAPD who require more effort to listen than the typical listener [17].

Considering the effects of APD on language, reading, and communicative skills, investigating central auditory processing skills seems necessary to increase our understanding of the relationships that exist among these entities. In general, assessment of CAPD involves screening and comprehensive assessment procedures. Questionnaires help to identify problems with listening that may require investigation [18]. The most important advantage of using questionnaires is that the examiner can obtain an overview of a person's listening difficulties in a short time [19]. Questionnaires can also be used to assess the effects of rehabilitation programmes following intervention in this population.

In the comprehensive assessment used by audiologists, behavioural and electrophysiological assessments of the central auditory system are applied. Auditory discrimination tests, auditory temporal processing, monaural low-redundancy speech tests, dichotic speech tests, and binaural interaction tests are administrated to assess CAPD behaviourally. Among important challenges with central auditory testing is that their results are influenced by the age, attention, and cognitive skills of the examinees. Moreover, performing auditory processing tests are difficult for children for multiple reasons described above [20].

Several questionnaires have been developed to identify auditory processing problems but the majority of them measure auditory processing in children [19,21–24] or have relatively few items [25].

One of the questionnaires in this field is the University of Cincinnati Auditory Processing Inventory (UCAPI). The UCAPI is a questionnaire with 34-items that involves the comprehensive assessment of auditory processing skills in adolescents and adults in several skills as follows (a) listening and concentrating, (b) understanding speech, (c) following spoken instructions, (d) attention, (e) educational assistance, and (f) other [26]. These skill areas were selected based on the symptoms that are the main signs in individuals with CAPD [27].

A review of the literature and after personal communication with the author (RWK) found that this scale has not been developed for languages other than English. There is no valid and reliable measure to quantify the central auditory processing of Persian-speaking adolescents and adults. Therefore, the present study aimed to investigate the translation, validity, and reliability of the Persian University of Cincinnati Auditory Processing Inventory (P-UCAPI).

Materials and methods

A methodologic and cross-sectional study was performed to translate and validate P-UCAPI. In total, we conducted a two-step study. In step 1, the P-UCAPI was translated to Persian. In the second step, descriptive statistics of the total score of participants in P-UCAPI and its subscales, internal consistency, and comparing the performance of females and males in P-UCAPI were investigated.

Stages of translation and content validity of P-UCAPI

The translation process of the P-UCAPI consisted of several phases. First, as a courtesy, the first author obtained permission from the developer of the UCAPI (Dr. R. Keith) to translate and validate the P-UCAPI. In the second stage, two native speakers of Persian who also spoke English and were experienced in translation and validation of questionnaires but were not familiar with the content of P-UCAPI independently translated the P-UCAPI according to the guidelines of the WHO. The authors asked each translator to consider conceptual equivalents rather than literal ones. Also, we asked the translators to select clear and simple words and avoid writing long sentences. The first author reconciled and unified two translations in one document. In this step, our goal was to reach the optimal translation for each item of the questionnaire. We tried our best to choose clear

and applicable words and terms for the general public [28]. The translated versions of two translators were checked item by item and the more appropriate words and terms were selected in the forward translated version of P-UCAPI. In the next stage, an expert panel involving two speech and language pathologists and one audiologist examined the content validity of the P-UCAPI. In the next stage, a bilingual translator who did not contribute to forward translation of UCAPI and was experienced in translating Persian texts to English performed the back translation of P-UCAPI. Then, we sent the back-translated version of P-UCAPI to the developer of the original version of UCAPI. The final version of P-UCAPI was prepared after modifying some suggestions made by the developer of UCAPI.

Participants

A total of 121 individuals (51 males and 70 females) in the age range of 13 to 53 and a mean of 28.41 years participated in this research. Participants were recruited from students and staff members attending the Babol University of Medical Sciences. All participants spoke Persian as their first language. They denied having a hearing loss, auditory processing, learning or language disorder. The sample was gathered through the convenience sampling procedure.

Procedure

P-UCAPI includes 34 items, seven of which are relevant to demographic information, occupational and educational background, and diagnostic history of the person. Twenty-seven items are categorized in six subscales containing listening and concentrating, (b) understanding speech, (c) following spoken instructions, (d) attention, (e) educational assistance, and (f) other. Each Item of these six subscales has multiple choices that examine listening abilities under different conditions. The results include a total score for each person and six scores for each subscale.

We asked each subject to read the questions, answer them and determine the ambiguous and difficult to understand questions. Item analysis of P-UCAPI was calculated using the item discrimination coefficient. The descriptive statistics of total scores of P-UCAPI and its subscales and comparison of the performance of females and males in P-UCAPI were reported for this measure. The process of face validity of P-UCAPI was performed by asking 10 participants (5 males and 5 females) to complete the P-UCAPI.

For the reliability, internal consistency or the correlation among the questions of the scale was calculated.

Statistical analysis

The content and face validity of the P-UCAPI were performed through the qualitative procedure. Descriptive statistics (Mean values, standard deviation, minimum, and maximum) were reported for total scores and subscales of P-UCAPI. Independent sample t-test was performed to compare the performance of males and females in P-UCAPI. Internal consistency and item analysis were calculated by Cronbach's alpha coefficient. Intraclass Correlation Coefficient (ICC) was applied to obtain the test–retest reliability. The significance level was set a priori at (p-value <.05).

Ethical issues

All of the respondents signed and filled a consent form before participating in the current study. We explained the aims and procedures to the participants. In addition, we confirmed that their participation in the present research was voluntary.

Results

The overall findings indicated that the translation processes of the P-UCAPI had acceptable quality. Also, Professor Keith approved the translation process by asking a Persian-speaking graduate student in his university to compare the two versions. The expert panel's members were in full agreement for the item except for a few words and terms. They discussed them to reach a consensus. Ten subjects who were recruited in the step of face validity could respond to the questions. None of the questions needed further explanation to answer.

The findings of the item analysis revealed that the value of Cronbach's alpha coefficient was not obtained higher than .83 after deleting each item. The results of the item analysis are shown in Table 1. The descriptive statistics (mean value, standard deviation, minimum, and maximum) of the total score and subscales of P-UCAPI are presented in Table 2.

As provided in Table 3, males and females did not have significant difference for the total score of P-UCAPI (t=-.55, p-value= .16) and its subscale including listen and concentrate (t=-1.16, p-value=.24), understand speech (t=-.51, p-value=.60), follow spoken instruction (t=-.21, p-value=.77), attention (t=-.05, p-value=.96), education assistance (t=-.36, p-value=.71), and other (t=-.35, p-value=.72), respectively.

Table 1. Item analysis of P-UCAPI.

Item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
8	.82	.36
9	.81	.44
10	.81	.50
11	.82	.31
12	.81	.53
13	.81	.59
14	.82	.32
15	.82	.00
16	.82	.00
17	.82	.00
18	.81	.46
19	.81	.41
20	.83	-.077
21	.83	-.02
22	.82	.00
23	.82	.00
24	.83	.12
25	.82	.09
26	.81	.48
27	.81	.43
28	.82	.33
29	.82	.38
30	.81	.40
31	.82	.25
32	.81	.42
33	.82	.36
34	.82	.41

Table 2. Descriptive statistics of mean values of P-UCAPI and its subscales of participants.

Dimensions	Descriptive statistics		
	Mean ± SD	Minimum	Maximum
Listening and Concentrating	13.51 ± 4.89	8	32
Understand Speech	5.77 ± 1.73	3	10
Follow Spoken Instruction	5.74 ± .0	1	11
Attention	8.70 ± 1.24	6	12
Education Assistance	5.68 ± 1.85	5	17
Other	13.98 ± 3.84	9	28
Total Score	53.04 ± 10.77	35	85

Note. SD: standard deviation.

Table 3. Comparison the mean values of P-UCPAI's subscales and total scores in males and females.

Dimensions	Male Mean ± SD	Female Mean ± SD	t	F	p Value
Listen and Concentrate	12.84 ± 4.26	13.96 ± 5.29	−1.16	2.43	.24
Understand Speech	5.67 ± 1.67	5.86 ± 1.81	−.51	.91	.60
Follow Spoken Instruction	5.73 ± 2.07	5.80 ± 2.11	−.21	.08	.77
Attention	8.71 ± .20	8.70 ± 1.25	−.05	.01	.96
Education Assistance	5.69 ± 1.53	5.73 ± 2.10	−.36	.75	.71
Other	13.82 ± 3.86	14.09 ± 3.86	−.35	.19	.72
Total Score	52.36 ± 10.07	53.23 ± 11.29	−.55	1.99	.16

Note. SD: standard deviation.

For the internal consistency, the value of the alpha coefficient value was (27 items; α=.82). The seven items were demographic questions that were not considered for calculating the internal consistency. The value of ICC for test–retest reliability of P-UCAPI was .62 ranging from .38 to .85.

Discussion

We reported the translation, validity, and reliability of P-UCAPI in this study, as a novel instrument to measure the central auditory-processing capabilities in adolescents and adults in Iran. The WHO guidelines were used to follow the translation stages of P-UCAPI [29].

The results of this study showed that there was not any evidence of auditory-processing disorders among participants. The results are consistent with the previous findings of persons with normal hearing [26].

The total score of females was slightly higher than the total score of males, but there is no significant gender difference in specific areas of auditory processing skills. Mattsson et al. [30] reported no gender difference in several auditory tests that were performed in children aged 7–12 years, but the age effect was seen in this study, indicating better tests performance by increasing age is consistent with the maturational process of auditory processing [30]. Namaziandost (1982) found that females had better performance at language learning [15]. Buss [31] found no significant effect of gender on auditory processing [31]. There is a gender difference in listening style, this means that men focussed more on verbal communication and listening vocabulary but women focussed more on nonverbal communication [32,33]. Several studies have shown the sex difference in laterality as a central auditory skill. Males are predominant in the right hemisphere and females are predominant in the left hemisphere [34,35].

The excellent value for the correlation among the scale's items indicated that the P-UCAPI measures a single variable. Since Cronbach's alpha value of 0.7 or higher is considered as the high value for internal consistency. The test–retest reliability of the scale was satisfactory and acceptable which showed repeatability of the findings over time.

In summary, the P-UCAPI is applicable for adolescents and adults with normal hearing. Since CAPD is very prevalent among older adults [36] developing a scale for addressing auditory processing problems is strongly recommended in this population.

Conclusion

Results of this study indicate that the P-UCAPI is an appropriate scale regarding psychometric properties (validity and reliability) for quantifying and describing auditory-processing skills in normal individuals. Further studies are suggested to administrate this scale on individuals with central auditory-processing

disorders to demonstrate the clinical significance of this instrument.

Disclosure statement

There is no conflict of interest to declare by authors.

ORCID

Fereshteh Bagheri http://orcid.org/0000-0003-4419-4524

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