Original Article

Artigo Original

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Nijmegen Cochlear Implant Questionnaire (NCIQ): translation, cultural adaptation, and application in adults with cochlear implants

Nijmegen Cochlear Implantation Questionnaire (NCIQ): tradução, adaptação cultural e aplicação em adultos usuários de implante coclear

Keywords

Hearing
Hearing Loss
Cochlear Implant
Quality of Life
Adults

ABSTRACT

Purpose: Cross-cultural adaptation and translation of the Nijmegen Cochlear Implant Questionnaire (NCIQ) into Brazilian Portuguese and analysis of quality of life (QoL) results in adults with cochlear implant (CI). **Methods:** The NCIQ instrument was translated into Brazilian Portuguese and culturally adapted. After that, a cross-sectional and clinical QoL evaluation was conducted with a group of 24 adults with CI. **Results:** The questionnaire title in Brazilian Portuguese is '*Questionário Nijmegen de Implantes Cocleares*' (NCIQ-P). The version of the NCIQ questionnaire translated into Brazilian Portuguese presented good internal consistency (0.78). The social and physical domains presented the highest scores, with the basic and advanced sound perception subdomains achieving the highest scores. No correlation between gender and time of device use was found for the questionnaire domains and subdomains. **Conclusion:** The cross-cultural adaptation and translation of the NCIQ into Brazilian Portuguese suggests that this instrument is reliable and useful for clinical and research purposes in Brazilian adults with CI.

Descritores

Audição
Perda Auditiva
Implante Coclear
Qualidade de Vida
Adultos

RESUMO

Objetivo: Traduzir e adaptar culturalmente para o Português Brasileiro o *Nijmegen Cochlear Implantation Questionnaire* (NCIQ) e descrever os resultados de qualidade de vida em adultos. **Método:** Tradução e adaptação cultural do NCIQ. Depois desta etapa, foi realizado um estudo transversal e clínico de avaliação da qualidade de vida em um grupo de 24 adultos usuários de implante coclear (IC). **Resultados:** O título do questionário na versão traduzida para o Português Brasileiro foi definido em Questionário Nijmegen de Implantes Cocleares (NCIQ-P). A versão traduzida do questionário NCIQ-P apresentou boa consistência interna para todos os domínios existentes no questionário (0,78). Os resultados de qualidade de vida em adultos demonstraram que os domínios mais pontuados foram o social e o físico, sendo os subdomínios percepção básica e avançada os de maior pontuação. Não foi observada correlação entre gênero e tempo de uso do dispositivo para os domínios e subdomínios existentes no questionário. **Conclusão:** A tradução e adaptação cultural do NCIQ-P sugere que o instrumento é válido e útil para o uso clínico e de pesquisa em adultos usuários de IC e falantes do Português Brasileiro.

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INTRODUCTION

Considering the technological and scientific advances that have occurred in the past decades, cochlear implant (CI) is no longer just a scientific research tool, but an effective clinical resource capable of improving the quality of life (QoL) of adults and children with severe and/or profound, bilateral, sensorineural hearing loss.

This sophisticated technological device is a computerized prosthesis, composed of an internal and an external component, which provides electrical impulses to stimulate the remaining neural fibers of the cochlea[1].

The clinical results obtained over the past decades in the CI user population in general demonstrated the effectiveness of this electronic device in providing sufficient peripheral stimulation for accessibility of speech sounds, with a direct positive impact on the general QoL of its users[2].

There have been many achievements with respect to surgical techniques, selection criteria of candidates, technological evolution applied to the current devices, and methods of assessment, habilitation, and auditory rehabilitation used in the clinical context[3].

However, not all CI users benefit from access to sounds in the same manner, with variability between results observed in clinical practice. Only the performance obtained in the auditory and language skills is not enough to justify the variability of results verified in the user population of this electronic device[4,5]. The need to use a measure that involves factors other than the aspects associated with hearing and speech has motivated researchers in this area to use QoL measures to evaluate the benefits and limitations of CI.

Therefore, the QoL assessment represents important information on the impact and effectiveness of treatment in order to complement the results obtained through clinical measures and evaluate the impact of hearing loss and the use of CI in different domains[6].

There is a worldwide trend towards the construction or adaptation of questionnaires that assess QoL in the different types of treatments in the health area. The generic instruments for QoL assessment can be used in patients with different health problems, and are developed aiming to dimension the impact of disease and the effectiveness of treatment on QoL, without showing specificity in relation to the disease and/or treatment of individuals.

However, because they are generic in nature and thus comprise a wide range of health problems, some items evaluated may not be relevant to a certain disease and/or treatment, making them less sensitive to specific populations[7].

In this context, instruments specific for QoL assessment in a given population are able to provide more accurate data, because the items that comprise the questionnaire are prepared so as to contemplate specific aspects associated with a certain disease and/or treatment.

In 2000, the Dutch researchers Hinderink, Krabbe, and Broek developed an instrument for assessing the QoL of adult CI users, this tool was named Nijmegen Cochlear Implant Questionnaire (NCIQ)[8].

It is a specific instrument used by several researchers to evaluate a variety of aspects associated with the QoL of the adult CI user population which evidences the impact of the use of this electronic device on the daily life situations of its users, on the perception of speech sounds, and on the cost-benefit assessment of this type of intervention[9-11].

In addition, the NCIQ can also be used to monitor the impact of technological innovations and of the auditory rehabilitation process on the QoL of adult CI users over the time of device use[12-14].

A more detailed investigation on aspects associated with QoL is of great importance not only for the clinical area, but also for the formulation of public health policies, in the sense that public resources can be allocated to fulfill different social necessities and provide specific interventions for this population. Therefore, it is worth highlighting the necessity to provide professionals of the area with a clinical tool capable of investigating CI results in the QoL of its users, considering that no specific instruments to assess the QoL of adult CI users are available in Brazil to date.

Therefore, the objective of this study was to adapt and translate the Nijmegen Cochlear Implant Questionnaire (NCIQ) into Brazilian Portuguese and describe the results of QoL in CI adult users.

METHODS

The present research was developed over 12 months in the Laboratory of Speech-language Pathology Research in Educational Audiology at the College of Medice of University of Sao Paulo - USP with the support of the Association of Hearing Impaired Individuals with Cochlear Implant (ADAP). The study was conducted in two stages: cross-cultural adaptation and translation of the Nijmegen Cochlear Implantation Questionnaire (NCIQ) into Brazilian Portuguese; prospective, clinical quality of life (QoL) assessment in a sample of cochlear implant (CI) adult users.

The study was approved by the Research Ethics Committee of the aforementioned Institution under process no. 797419/14. All participants agreed with the procedures and signed an Informed Consent Form (ICF) prior to study commencement.

The Nijmegen Cochlear Implant Questionnaire (NCIQ) is a specific instrument of high internal consistency used to assess QoL in adult CI users. It comprises 60 questions divided into three general domains and their respective subdomains: physical - basic sound perception, advanced sound perception, and speech production; psychological - self-esteem; and social - activity limitations and social interaction[8].

The NCIQ was formulated with 10 items in each subdomain. Each of the first 55 items has five possible response categories, namely, never (1), sometimes (2), often (3), mostly (4), and always (5). The final five items present response categories as follows: no (1), poorly (2), moderate (3), adequate (4), and good (5). Respondents are also offered a sixth response category to cover items that were not pertinent to them - not applicable (N/A). A minimum of seven of the 10 items must be filled in to complete a specific subdomain. The score for each subdomain response is recoded as follows: 1 = 0, 2 = 25, 3 = 50, 4 = 75, and 5 = 100. Computation of the subdomains is performed by adding the 10- item scores of each subdomain and dividing by the number of completed items.

Semantic and cultural adaptation and translation of the NCIQ into Brazilian Portuguese was authorized by the authors of the questionnaire affiliated to the University of Nijmegen[8] and followed the technique proposed by the Scientific Advisory Committee of Medical Outcomes Trust[15], including the steps outlined ahead:

- Forward translation of the NCIQ into Brazilian Portuguese by certified translator with no involvement with the research;
- Review of the forward translation performed by two bilingual professionals (Portuguese and English) in the Audiology area;
- Backward translation performed by translator with no involvement with the research;
- Assessment of the equivalence between the two questionnaires - the original provided by the authors and the reverse translation into English performed by the same bilingual speech-language therapists.

For analysis of the questionnaire translation, a description of the aspects experienced during this process was provided regarding the semantic divergences between the translators and the equivalence between the English and Brazilian Portuguese versions. After concordance analysis and eventual modifications of the translated version of the questionnaire, the final version of the NCIQ translated into Brazilian Portuguese was sent by mail to the study participants.

In total, 49 CI users were contacted and invited to participate in the study according to the following inclusion criteria: aged 18-60 years; High School as minimum level of education; post-lingual hearing impairment, and CI use ≥12 months. However, only 24 individuals answered the NCIQ-P questionnaire in its entirety, thus constituting the sample of this study.

Regarding gender, the participation of individuals was balanced, with a slight predominance of males (54%). With respect to schooling, most of the participants had College Degree (70%) and High School Diploma (21%). Mean age was 36 years; the youngest individual was 18 years old and the oldest was 60 years old. Mean cochlear implant use time was 8 years, ranging from 1.5 to 18 years.

The data obtained after completion of the questionnaire were submitted to statistical analysis using the SPSS 21 software. Descriptive analysis was performed by frequency, with percentage for the qualitative variables and median and interquartile range for the quantitative variables.

The Cronbach's α test was used to assess the overall reliability of the NCIQ as for the internal consistency for the Brazilian Portuguese version of the domains of the questionnaire. The Cronbach's α test is a statistical tool that quantifies, on a scale of 0 to 1, the reliability of a questionnaire. An α coefficient ≥0.70 is sufficient to consider a questionnaire reliable. The Kruskal-Wallis test was applied to compare groups according to gender, whereas the Spearman correlation coefficient was used to investigate the relationship between the score and the time of CI use (the date of activation of the device was considered for time of use calculation). A significance level of 5% was adopted for all statistical analyses.

RESULTS

The translated version of NCIQ included the 60 questions proposed in the original version divided into three general domains and their respective subdomains: Physical (basic sound perception, advanced sound perception, and speech production); Psychological (self-esteem) and Social (activity limitations and social interaction).

Regarding the semantic content of the items, in the comparison between the two translations, small differences were found for the following terms: Impairment - translated into Brazilian Portuguese as "auditory problem", Hobbies - translated as "pastime", Front door - translated as "entrance door", and Sticking up for yourself - translated as "stand up for yourself". These divergences did not interfere with the translation of the NCIQ, considering that throughout the backward translation of this instrument, no discrepancies were found in the terms and meaning of the items when compared with the original English version.

The translated version of the NCIQ questionnaire (Annex A) was applied to the study participants and answered in its entirety, and the respondents had no difficulties in understanding the questions. The title of the questionnaire translated into Brazilian Portuguese was defined as *Questionário Nijmegen de Implantes Cocleares* (NCIQ-P).

The Cronbach's α coefficient calculated for all domains and subdomains in the NCIQ-P represented the overall reliability of the questionnaire (0.78), showing good internal consistency, both for the domains in the questionnaire and for the NCIQ-P general analysis (Table 1).

Benefits were observed in the different aspects associated with quality of life (QoL), considering that high values were verified both in the NCIQ-P general score (70.25) and in the social (71.1), physical (70.9), and psychological (66.5) domains.

Among the subdomains of the NCIQ-P, the highest averages were obtained for advanced sound perception (76.8), activity limitations (73.1), and basic sound perception (72.7) (Figure 1).

The scores obtained by the study participants in each domain and their respective subdomains were analyzed in relation to time of CI use and gender. No correlation was found between time of CI use (Table 2) and participant gender (Table 3) and the domains and subdomains of the NCIQ-P.

Table 1. Cronbach's α coefficient values for the NCIQ-P domains and subdomains

Subdomain	Cronbach's α coefficient
Basic sound perception	0.76
Advanced sound perception	0.90
Speech production	0.77
Self-esteem	0.72
Activity limitations	0.92
Social interaction	0.75
Total	0.78

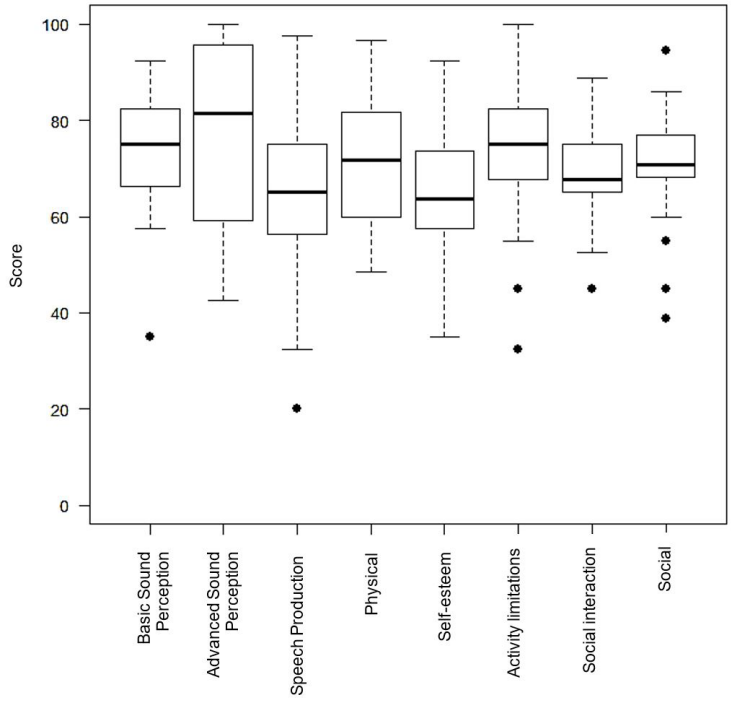

Figure 1. Scores obtained for the NCIQ-P domains and subdomains

Table 2. Correlation between time of CI use and the NCIQ-P domains/subdomains

Domains/Subdomains	R**	*p*
Physical	-16%*	0.47*
Basic sound perception	5%	0.82
Advanced sound perception	-21%	0.32
Speech production	-24%	0.27
Social	0%*	0.99*
Activity limitations	-1%	0.95
Social interaction	8%	0.72
Psychological - Self-esteem	-21%*	0.33*

*Statistically significant values (P <0.05); **R: Spearman correlation coefficient

Table 3. Descriptive measures for the NCIQ-P domains and subdomains according to gender

Domains/Subdomains	Gender	Mean	Standard deviation	Median	Q1*	Q3*	Minimum	Maximum	*p*
Basic sound perception	F	71.4	15.7	75.0	65.0	81.3	35.0	92.5	0.9
	M	73.8	9.4	75.0	70.0	82.5	57.5	85.0	
Advanced sound perception	F	73.0	21.6	62.5	56.3	95.2	42.5	100.0	0.4
	M	80.0	15.6	82.5	67.5	93.8	55.0	100.0	
Speech production	F	67.0	14.8	65.0	58.8	75.0	45.0	97.5	0.6
	M	60.0	18.8	65.0	55.0	72.5	20.0	82.5	
Physical	F	70.5	15.6	70.0	60.0	83.4	48.4	96.7	>0.99
	M	71.3	11.1	73.5	66.1	80.0	52.5	86.7	
Self-esteem	F	67.5	15.6	67.5	62.5	76.1	35.0	92.5	0.5
	M	65.6	13.9	60.0	57.5	72.5	50.0	92.5	
Activity limitations	F	76.9	13.7	72.5	68.9	82.5	55.0	100.0	0.8
	M	69.9	16.3	75.0	65.0	77.5	32.5	88.9	
Social interaction	F	73.4	8.9	70.0	67.1	77.5	65.0	88.9	0.2
	M	65.7	11.9	67.5	62.5	75.0	45.0	83.3	
Social	F	75.1	10.9	70.0	68.7	78.8	60.0	94.4	0.6
	M	67.8	13.5	71.4	68.8	75.0	38.8	86.1	

*Q1: first quartile; *Q3: third quartile

DISCUSSION

This study aimed to culturally adapt and translate the Nijmegen Cochlear Implant Questionnaire (NCIQ) into Brazilian Portuguese and describe the results of QoL in cochlear implant (CI) adult users in order to provide the clinical and scientific community with a tool to analyze the quality of life (QoL) of this population.

The use of a specific questionnaire to assess the QoL in CI users allows identification of particularities pertinent to this clinical group of cases in order to provide a useful clinical record that can guide treatment goals and record small changes after intervention[16].

Translation and validation of the NCIQ in several languages, namely, Italian, Spanish, and Chinese, has enabled wide use of this instrument in the current clinical setting[17-19].

As for the translation and semantic adaptation of the NCIQ to Brazilian Portuguese, it is worth noting that the participants of this study did not find difficulties in understanding the content of the items. All questions were filled in by all the participants, and this information contemplates the recommendation of the authors of original version of the questionnaire and ensures its cultural equivalence for Brazilian Portuguese-speaking CI users[20].

The version of the NCIQ translated into Brazilian Portuguese showed good internal consistency (Cronbach's α coefficient of 0.78), corroborating the data described in the literature[8,18].

Thus, as observed in previous studies, the results of this research showed that, after one year and five months of CI activation and regardless of gender, there was a positive effect on the users' QoL for all domains evaluated: physical, social, and psychological[8,21,22].

The overall score obtained in the group of individuals evaluated by the NCIQ-P version (70.25) was close to the data reported by other authors, (74.2) and (63.26), and described in the scientific literature[18,22].

The highest score was verified in the social domain, in agreement with the findings of previous studies[23,24]. This result is associated with the fact that this domain best represents the way CI interferes positively in the QoL of its users, because improvement of the auditory skills offers benefits in communication, contributing to better social interaction in daily life activities and broadening social relations. Other previous studies have reported that the benefit of speech perception seems to be a predictor of gains in QoL[24-26].

The high overall score obtained in this study for the subdomains basic and advanced sound perception, which belong to the physical domain, has also been described in the specific scientific literature[10,14,24,27,28].

Possibly, these subdomains reflect more punctually the direct benefits of CI use, in the sense of providing better and greater access to speech sounds and, with this, reducing the impact of hearing impairment on communication situations.

The authors of the original version of the NCIQ[8] stressed that expressive scores in the subdomains basic and advanced sound perception would be fully justified if it were understood that, prior to surgery, these individuals were in hearing deprivation and, after activation of the CI, they had access to speech sounds. Other studies have also identified that these subdomains were characterized as the aspects that best reflected the direct benefits of using this technology[10,27].

Regarding the time of CI use, no correlation was found between this variable and the scores obtained in the domains and subdomains of the questionnaire. Other authors have also observed no significant correlation between QoL assessment and time of CI use[23].

It is worth emphasizing that the benefits obtained with CI may vary within a studied group, because there are innumerable factors that can interfere with results, such as etiology of hearing deficiency, age of the diagnosis and the intervention, time of sensorial deprivation, and survival of neural elements to be stimulated, as well as factors associated with motivation, use, and family support. Associated with this, the existing subjectivity for the term quality of life must also be considered, because it is related to the perception that each individual has of their health situation.

In this context, after the availability of the NCIQ-P to assess the QoL of Brazilian-speaking CI users, comparison between the data obtained with this clinical instrument and the results of the speech perception tests may contribute significantly for a more detailed understanding of the impact and effectiveness of this technology, as well as for monitoring the evolution of patients over the time of CI use.

CONCLUSION

It was possible to culturally adapt and translate the NCIQ into Brazilian Portuguese so that professionals of the area can be provided with a valid and useful instrument to assess aspects associated with quality of life (QoL) after activation of the cochlear implant (CI). From the perspective of the users, the CI improved their QoL, mainly in the physical and social domains. No correlation was observed between the variables gender and time of CI use for the QoL domains and subdomains of the NCIQ-P.

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Author contributions

NPS was responsible for collection, classification, and analysis of the data and writing of the manuscript; MIVC collaborated in data analysis and revision of the manuscript; ACMC was responsible for the design and general orientation of the study stages, and preparation of the manuscript.

Annex A. Nijmegen Cochlear Implant Questionnaire for Brazilian Portuguese (NCIQ-P)

Por favor, responda às seguintes 60 questões sobre a situação do IC (apenas utilize "não aplicável" [N/A] se nenhuma das possibilidades for aplicável).

	Nunca	Às Vezes	Regularmente	Geralmente	Sempre	N/A
1. Você consegue ouvir ruídos de fundo (descarga da privada, aspirador de pó)?						
2. O seu problema auditivo atrapalha o seu contato com pessoas de audição normal?						
3. Se precisar, você consegue sussurrar?						
4. Você se sente à vontade em grupo apesar de seu problema auditivo?						
5. Você consegue ter uma conversa com uma pessoa em um ambiente silencioso (com ou sem leitura labial)?						
6. O seu problema auditivo lhe causa grandes transtornos no trabalho ou no estudo?						
7. Você consegue ouvir os passos de outras pessoas em sua casa (ex: no corredor ou na escada)?						
8. O seu problema auditivo lhe causa grandes transtornos ao se comunicar com surdos?						
9. Se precisar, você consegue gritar?						
10. O seu problema auditivo lhe incomoda?						
11. Você consegue ter uma conversa com 2 ou mais pessoas em um ambiente silencioso (com ou sem leitura labial)?						
12. O seu problema auditivo lhe causa grandes transtornos no trânsito?						
13. Você consegue ouvir quando o seu próprio telefone ou campainha tocam?						
14. O seu problema auditivo lhe causa grandes transtornos quando você está com um grupo de pessoas (passatempo, esportes, férias)?						
15. Você consegue ser entendido por desconhecidos sem o uso de gestos?						
16. Você fica irritado se não consegue acompanhar uma conversa?						
17. Quando você está em uma loja cheia de pessoas, você consegue entender o vendedor?						
18. O seu problema auditivo lhe causa grandes transtornos durante atividades de lazer?						
19. Quando você está ocupado em casa, você consegue ouvir (e não sentir) uma batida forte na porta de entrada?						
20. A sua dificuldade auditiva lhe causa grandes problemas no seu relacionamento com as pessoas com quem você vive (sua família/ parceiro(a))?						
21. Você consegue adaptar a sua voz a situações diferentes (ambiente barulhento ou ambiente silencioso)?						
22. Você evita falar com desconhecidos?						
23. Você consegue apreciar músicas?						
24. O seu problema auditivo lhe causa grandes transtornos na sua rotina em casa?						
25. Você consegue ouvir carros se aproximando no trânsito?						
26. Quando está em grupo, você é deixado de lado devido ao seu problema auditivo?						
27. Desconhecidos conseguem perceber pela sua voz que você é surdo ou deficiente auditivo?						
28. Você pede para outras pessoas falarem mais alto ou de forma mais clara se estiverem falando muito baixo ou sem clareza?						
29. Você consegue reconhecer determinadas melodias em músicas?						

30. O seu problema auditivo lhe causa grandes transtornos quando você faz compras?						
31. Você consegue ouvir sons suaves (chaves caindo, barulho de micro-ondas)?						
32. Você vai a lugares em que o seu problema auditivo possa se tornar uma grave desvantagem?						
33. Você consegue ser entendido por conhecidos sem o uso de gestos manuais?						
34. Você se sente aflito ao falar com desconhecidos?						
35. Você consegue reconhecer determinados ritmos em músicas?						
36. O seu problema auditivo lhe causa grandes transtornos ao assistir televisão?						
37. Você consegue ouvir (e não sentir) quando alguém se aproxima de você por trás?						
38. O seu problema auditivo impede o seu contato com pessoas que vivem no seu bairro?						
39. Com que frequência você fica aborrecido por pessoas detectarem na sua voz/ fala que você tem um problema auditivo?						
40. Você consegue entender desconhecidos sem fazer leitura labial?						
41. O seu problema auditivo lhe causa grandes transtornos em festas (ex: aniversários)?						
42. Você consegue ouvir (não necessariamente compreender) pessoas falando no rádio?						
43. O seu problema auditivo lhe causa grandes transtornos quando você está com amigos?						
44. Você consegue fazer contato facilmente com outras pessoas apesar do seu problema auditivo?						
45. Você consegue ouvir a diferença entre a voz de um homem, de uma mulher e de uma criança?						
46. O seu problema auditivo lhe causa grandes transtornos ao lidar com assuntos formais (seguro, advogado ou prefeitura)?						
47. Você consegue ouvir quando alguém o chama?						
48. O seu problema auditivo lhe causa grandes transtornos no seu relacionamento com membros de sua família?						
49. Há momentos em que você sente que seria mais feliz se não tivesse um problema auditivo?						
50. Você se sente cansado tentando ouvir (com ou sem leitura labial)?						
51. O seu problema auditivo lhe causa grandes transtornos quando você sai ou viaja?						
52. Você pode ouvir vozes vindas de outro cômodo (ex: crianças brincando, bebê chorando)?						
53. Quando você está em um grupo, você sente que o seu problema auditivo impede que as pessoas o levem a sério?						
54. O seu problema auditivo diminui a sua autoconfiança?						
55. O seu problema auditivo lhe impede de se colocar no trabalho ou em relacionamentos?						
Observe: as categorias de resposta para as seguintes 5 questões mudaram						
	Não	Insatisfatório	Satisfatório	Bom	Muito Bem	N/A
56. Você consegue fazer a sua voz parecer irritada, amigável ou triste?						
57. Você consegue controlar o tom da sua voz (agudo ou grave)?						
58. Você consegue controlar o volume da sua voz?						
59. Você consegue fazer a sua voz parecer “natural” (de forma que não pareça a voz de um surdo)?						
60. Você é capaz de manter uma conversa simples ao telefone?						

CODE BOOK

Domain	Question	Recoding (6 score)
Physical		
Basic sound perception	1, 7, 13, 19, 25, 31, 37, 42, 47, 52	
Advanced sound perception	5, 11, 17, 23, 29, 35, 40, 45, 50, 60	50
Speech production	3, 9, 15, 21, 27, 33, 56, 57, 58, 59	27
Psychological		
Self-esteem	4, 10, 16, 22, 28, 34, 39, 44, 49, 54	10, 16, 22, 34, 39, 49, 54
Social		
Activity limitations	6, 12, 18, 24, 30, 36, 41, 46, 51, 55	6, 12, 18, 24, 30, 36, 41, 46, 51, 55
Social interaction	2, 8, 14, 20, 26, 32, 38, 43, 48,53	2, 8, 14, 20, 26, 38, 43, 48, 53