

# LittleEars™ – Hearing questionnaire: semantic and cultural adaptation of the version of the Littleears™ questionnaire in Portuguese with families of children with hearing loss

## LittleEars® – Questionário auditivo: adaptação semântica e cultural da versão em Português Brasileiro em pais de crianças com deficiência auditiva

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### ABSTRACT

**Purpose:** Semantic and cultural adaptation of a preliminary Portuguese version of the questionnaire LittleEars® in families of children with hearing loss. **Methods:** Instrument administered as an interview or questionnaire, using a validated translation of LittleEars® Questionnaire in Portuguese with parents of children with hearing loss up to two years of hearing age. Parent's comments, questions, suggestions, examples, comments or difficulties were used for development of the adapted version. A brainstorming session with a group of experts was held to validate the final version. **Results:** Participants were 37 individuals who answered the questionnaire, parents of 32 children. Only four parents preferred to answer the questionnaire format, while 28 preferred to answer it as an interview. In the interview format, parents had difficulty understanding different items. Upon review and discussion of the comments of the families, a modified version was proposed. **Conclusion:** Changes in the questionnaire items were related to vocabulary, idiomatic expressions and unknown examples. The results of the questionnaire LittleEars® varied depending on hearing age and Speech Intelligibility Index - SII, suggesting that the adapted translation has sensitivity for measuring the hearing abilities. Other studies should apply the new version and final validation.

**Keywords:** Hearing loss; Parents; Hearing aids; Hearing tests; Early intervention (education)

### RESUMO

**Objetivo:** Adaptação semântica e cultural de versão preliminar em português do questionário LittleEars® em famílias de crianças com deficiência auditiva. **Métodos:** Instrumento administrado como entrevista ou questionário, em tradução validada do Questionário LittleEars® em português em pais de crianças com deficiência auditiva com até dois anos de idade auditiva. Comentários, dúvidas, sugestões, exemplos, críticas ou dificuldades dos pais foram utilizadas para elaboração da versão adaptada. Foi então realizada reunião para *brainstorming* com grupo de especialistas, para validação da versão final. **Resultados:** Trinta e sete sujeitos, pais ou responsáveis de 32 crianças, responderam ao questionário. Somente quatro pais preferiram responder no formato de questionário, enquanto 28, em entrevista. No formato entrevista, houve dificuldade de compreensão em diversos itens. Após análise e discussão dos comentários das famílias, foi proposta uma versão modificada. **Conclusão:** As modificações nos itens do questionário estiveram relacionadas a vocabulário, expressões idiomáticas e exemplos desconhecidos. Os resultados obtidos com o questionário LittleEars® no grupo estudado variaram conforme a idade auditiva e o Índice de Inteligibilidade de Fala (*Speech Intelligibility Index* - SII), o que sugere que a tradução adaptada tem sensibilidade para medir as habilidades auditivas. São necessários estudos com a versão proposta, em uma população maior, visando sua validação final.

**Descritores:** Perda auditiva; Pais; Auxiliares de audição; Testes auditivos; Intervenção precoce (educação)

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## INTRODUCTION

Early diagnosis of hearing loss and appropriate speech therapy up to 6 months of age enable the development of oral language with the use of suitable electronic devices - individual sound amplification devices (hearing aids), or cochlear implants (CI). Several instruments address the issue of factors that determine auditory and language skills<sup>(1,2,3)</sup>, many of them individualizing the perception of the family in relation to the child's language development<sup>(4,5,6)</sup>. The issue of therapeutic fit with infants has also been discussed. Prognosis of development of auditory skills during hearing aid verification procedures requires the use of reliable instruments in the amplification validation process in the early stages of the therapeutic process<sup>(7,8,9,10)</sup>. This process requires instruments to assess the auditory development of very young children who use hearing aids or cochlear implants<sup>(11,12)</sup>.

The LittlEars® questionnaire was developed<sup>(13)</sup> in 2003 to assess the auditory skills of the population of infants and children with hearing age up to two years, based on the observation of parents, considering that on this age group the observation of auditory behavior and application of formal tests are more difficult<sup>(14)</sup>. It was created by audiologist researchers from a manufacturer of cochlear implants - Med-El - and can also be used to evaluate infants using hearing aids. The Auditory Questionnaire LittlEars® is easy to be answered and was initially proposed in the written form. It consists of 35 items, with response alternatives "yes" or "no" that assess the auditory development of children during the first two years of using the device, addressing aspects of receptive, semantic and expression of language skills of very young children in response to auditory input.

It was initially validated in children with cochlear implants in Germany and Italy and was considered reliable and with good internal consistency. In Canada, researchers<sup>(14)</sup> validated this questionnaire in English with families of children with normal hearing and pointed to future work in order to characterize the scores as a routine for infants and children with hearing loss who use hearing aids. The authors concluded that the instrument can be applied in the form of printed questionnaire or in the form of interview. The total score of answers 'yes' is compared with the previously established curve of scores of children with normal hearing.

In a different study, the auditory questionnaire was internationally applied to a population of 3309 infants and children with normal hearing and results showed high validity and reliability values<sup>(15)</sup>. In that population, the Auditory Questionnaire LittlEars® was easily answered and the approximate time to complete it was less than ten minutes. Several studies have used the questionnaire due to the simplicity in application, use of everyday examples, and strong relationship with hearing and chronological age of users of electronic devices<sup>(16)</sup>.

In Brazil, assessment protocols for young children are needed due to the implementation of the Unified Health System (SUS) and the Universal Newborn Hearing Screening.

Translation of international instruments to Portuguese can be considered a simple task, however, adaption of vocabulary and culture considering the population diversity is a challenge to be faced, both in presentation form and in the vocabulary and examples used.

In developed countries, the population is accustomed to instruments involving written texts and filling out forms in various activities of their routines. In Brazil, a country of great cultural diversity, assessment tools that depend on form filler can bring significant reliability problems. The process of reading comprises a number of complex issues involving individual aspects such as cognitive, linguistic, and extra-linguistic, which may result in distortion factors when questionnaires are applied in less literate population<sup>(17)</sup>.

The LittlEars® uses songs, rhymes, and games of specific communities in different regions of the country, which it was adapted and validated. Not always the examples are understood by a different population, and for this reason, this study aimed to carry out the first translation and validation step of questionnaire step to Portuguese, aiming for their cultural adaptation for use with parents of children in Brazil.

## METHODS

This study meets the ethical criteria of Ordinance 196/96 of the National Health Council and was approved by the Ethics Committee of *Pontifícia Universidade Católica de São Paulo* (PUC) under number 201947. Parents of each participant with hearing disabilities were invited to participate in the study and signed the Informed Consent Form. The questionnaire was carried out in a high-complexity referral service for Hearing Health specialized in services for hearing impaired children under the age of 3 years.

Parents and/or guardians of 32 children (25 boys and 7 girls) with hearing loss and hearing age of two years who received individual hearing aids participated in the study by answering the LittlEars® with questionnaire or by interview. Adults who accompanied the children and better knew their routines participated. Respondents were two grandmothers (6.3%), 23 mothers (71.9%), two parents (6.3%) and five couples who responded jointly to the questionnaire (15.6%). According to the classification of ABEP- Brazilian Research Company Association<sup>(18)</sup>, the distribution by socioeconomic status of families who answered the LittlEars® questionnaire: 6.2% were A2 Class, 3.1% of B1 Class, 12.5% B2 Class, 56.3% of the C Class, 6.3% of D Class and 15.6% did not provide this information.

The chronological age of the children ranged from 5.7 months to 75.5 months and only one had chronological age of 48 months. The hearing age ranged between zero and 20 months as the questionnaire was conducted with parents of children who had just fitted their hearing aids and others who were using hearing aids for more than a year. The time of daily use of hearing aids ranged between zero and 12 hours a day.

As for hearing loss, the individuals were classified according to the Speech Intelligibility Index (SII), a measure that evaluates the audibility of the speech signal in the selection process, during the electroacoustic verification of hearing aids. It determines the proportion of information of audible speech and useful to the listener and has high correlation with the speech intelligibility (ANSI S3.5 - 1997 [R 2012]). The SII values are represented on a scale from zero to 100%, where zero means no audibility, and 100% means audibility of all speech sounds. Chart 1 summarizes the classification of hearing loss per group and intervals of SII 65 according to Figueiredo<sup>(19)</sup>.

The tool used was the LittlEars® - Auditory Questionnaire: questionnaire for parents to assess auditory behavior, translated into Portuguese, the first stage of this study.

### Determining the validation steps

The criteria recommended by *Scientific Advisory Committee of the Medical Outcomes Trust*<sup>(20)</sup> were used for translation and demonstration of the psychometric properties. The first stage of LittlEars® questionnaire validation process to Portuguese aimed at the translation and linguistic and cultural adaptation, according to the criteria of that Committee.

The first translation of LittlEars® questionnaire into Portuguese was the responsibility of Med-El that developed the instrument and it was reviewed by professional audiologists. The instrument was then back-translated to English and was considered equivalent. The second version - considered equivalent to the original version in English - was the version used in this study. Printed copies of the instrument were prepared in Portuguese, in the same format of the original instrument. Aiming at the semantic adaptation<sup>(21)</sup>, the questionnaire was administered to parents and/or guardians of 32 children who were hearing aids users to check if the items were intelligible to the representative strata of the population under study. The understanding was analyzed in every question. Thus, suggestions have been asked if the question was not considered clear.

### Procedures

#### Application of the LittlEars® Questionnaire

Information about the topic of the instrument was provided on day of application. Families were also informed about the

possibility to choose the mode of instrument's administration: in writing, as the original version, or through interviews, for better understanding by those with difficulty in understanding written texts. In both formats, the explanation about the objectives of the instrument and the expectations regarding the hearing behavior was carried out personally.

The interviews took place immediately after the choice for the format. Comments of parents were recorded during the interview and observations of the researcher on the need for repetition or reformulation of the question or examples of the questionnaire. Words that parents reported not knowing the meaning were also recorded. When starting the application of the instrument, the information was recorded and questions raised were transcribed.

When the respondent opted for the written format (printed questionnaire) he could respond at home or, if preferred, answer at the waiting room. The respondent was instructed to answer beside the questions, to comment with the researcher any difficulties in understanding any item, and to make suggestions, comments, criticism about the instrument. It was agreed that the return of the questionnaire would be made in the following session.

The recorded material was reviewed, registered and organized into tables: date of application of the instrument, hearing age, everyday record of the hearing aids (average hours of use/day), SII 65 dB, questionnaire scores, application format (interview or questionnaire), respondent, time to answer questions, and questions and doubts related to the items or examples.

#### Brainstorming: evaluation of semantic equivalence

Brainstorming (discussion group) is a dynamic group technique where people gather and use their thoughts and suggestions in order to reach an effective common denominator to get innovative or creative ideas and bring forward a given project. A brainstorming group with six experts in pediatric audiology, familiar with the service and the instrument was formed. The discussion followed the dynamic item analysis of each item of the questionnaire, considering the responses and comments from the parents. The final proposed text was established by discussion and consensus. The completion of the version regarding semantic appropriateness of synonyms in English of the questionnaire items was completed by the analysis of the notes of parents and the discussion group.

**Chart 1.** Classification<sup>(19)</sup> of hearing loss according to group and ranges of SII65 - IntSII :

| Audiological characteristics   | SII 65 range= (IntSII)                                |
|--|---|
| Profound/flat configuration<br>Profound/high frequency<br>Profound/very high frequency | Int <sub>SII</sub> ≤ 35<br>SII 65 up to 35%           |
| Severe and profound up to 90 dBHL/flat and slightly high frequency                     | Int <sub>SII</sub> 36-55<br>SII 65 between 36 and 55% |
| Moderate and severe up to 66 dBHL/ flat and slightly high frequency                    | Int <sub>SII</sub> ≥ 56<br>SII 65 higher than 55%     |

The surveys and analysis of audiological and demographic characteristics of the participants were carried out, including preference for questionnaire application mode (interview or written questionnaire) considering audiological and demographic characteristics of suggestions, criticisms, comments and other examples for specific items. Item alterations were also established at meetings with parents and analysis of the group of experts. Based on discussions with experts and referrals made by the group meeting, a new linguistically and culturally adapted version was proposed for Portuguese.

## RESULTS

The summary measures for the quantitative variables and absolute and relative frequencies (in percentage) for qualitative variables are shown in Table 1.

The value of SII 65 dB ranged from 8% to 88%, i.e. there were children with good audibility to speech sounds and others that even though hearing aids users, had little audibility of speech sounds and were referred for cochlear implantation. As for the distribution of Speech Audibility Index - SII 65 dB, 29% of children had profound loss with SII between 0 and 35%, 39% were in the middle range between 36% and 55% of SII values, and 32% with SII greater than 55%.

Regarding the performance on LittlEars®, the range on parent responses was between 0 and 34. The interview ranged between 4 and 16 minutes. Standard deviations and means of the variables for each type of application were calculated. The difference between the averages of the variables was subsequently evaluated according to the type of instrument application using non-parametric test. For the variable *Interview Time*, it was not possible to perform the test because among the five interviewed through a questionnaire, only 2 had recorded the interview time.

Regarding the preference for instrument administration, 4 parents (12.2%) chose to answer the questionnaire format and 28 (87.85%) chose the interview format. The preference for interview seemed to be related to the socioeconomic status of the parents, as 56.3% of parents were classified as Class C. Among the parents who preferred questionnaire, two were classified as B2, two were classified as C, and one as A2, which, according

to the classification of ABEP (14), had accessibility to reading and should feel more confident about his choice.

### Relations between questions and examples with doubts, suggestions, comments, hearing age, chronological age and SII

The comparative analysis between interview or questionnaire and the difficulty with the questions or their examples showed a significant difference regarding the amount of questions with doubts ( $p=0.04$ ). However, this difference may not represent easily as the understanding of the question, considering the small number of parents who chose the questionnaire method. This result should be cautiously interpreted, as the number of questions with doubts was assessed by the interviewer in the case of application through an interview, and the interviewee in the case of the questionnaire, allowing the interviewer to be more careful the respondent with respect to the quantity of questions with doubts. There is also the possibility that the respondent has asked for help in understanding the questions and had not comment with the interviewer. There was no significant difference in the mode chosen and hearing age, chronological age and SII.

Parents made suggestions regarding the questionnaire. One of these suggestions was to change items that they had failed to understand. They also gave other examples, or suggested different word to replace the item, and these suggestions were accepted. Parents who answered the instrument in questionnaire format, reported no difficulties in reading and interpretation. The suggestions were detailed and organized by item, detailing each comment aiming preliminary inspection and guidelines for the meeting of experts, as well as to identify discrepancies (Chart 2).

A scatter plot with the variables “number of people with difficulty with the question” and “number of people with difficulty in the example” was constructed, in which difficulty represents comments, questions and/or suggestions. In general, most people had difficulties with questions than with examples. Additionally, 10 people or more, had difficulties in questions 10, 17, 18, 22, 23, 30 and 34 and 5 or more people showed difficulties in the example of questions 13, 19, 23, 33 and 35 (Figure 1).

**Table 1.** Summary of quantitative variables

| Variable                     | Minimum | 1 <sup>st</sup> quartile | Mean | Median | 3 <sup>rd</sup> quartile | Maximum | Standard deviation |
|------------------------------|---------|--------------------------|------|--------|--------------------------|---------|--------------------|
| SII                          | 8.0     | 26.5                     | 49.1 | 49.0   | 73.0                     | 88.0    | 25.5               |
| Chronological age (months)   | 5.7     | 12.7                     | 25.6 | 25.1   | 34.0                     | 75.5    | 14.7               |
| Hearing age (months)         | 0.0     | 1.0                      | 7.1  | 5.0    | 13.2                     | 20.7    | 6.7                |
| HA use – right ear (h/day)   | 0.0     | 3.0                      | 6.8  | 8.0    | 10.0                     | 12.0    | 4.1                |
| HA use – left ear (h/day)    | 0.0     | 4.5                      | 7.3  | 8.0    | 10.0                     | 12.0    | 3.7                |
| LittlEars®                   | 0.0     | 10.0                     | 19.4 | 22.5   | 27.0                     | 34.0    | 10.3               |
| Interview duration (minutes) | 4.0     | 6.0                      | 8.9  | 8.0    | 10.5                     | 16.0    | 3.2                |

**Subtitle:** SII = Speech Intelligibility Index; HA = hearing aid; h = hours

**Chart 2.** Examples of preliminary inspection of items 1 to 5 for the brainstorming meeting and identification of discrepancies

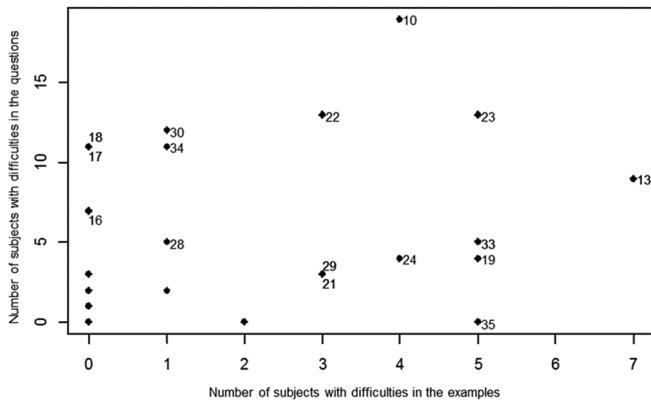
|                             | <b>1. Does your child respond to an unfamiliar voice?</b>   | <b>Example: smile; look to the speaker; speaks merrily.</b>   |
|-----------------------------|---|---|
| Observation of parents:     | Six parents (M13, M16, M19, M22, M23, A1 e P1) did not comprehend the question. They were able to comprehend the question after the examples were provided. | No comments.  |
| Observation of interviewer: | In this question, I suggest the following modification "Does your child respond when someone in your family talks?"   | If there is no change in the question, I believe a modification in the example is necessary.                                    |
| <i>Brainstorming:</i>       | Does your child respond to a voice of someone he knows?   | Smile; look at who is speaking; speaks enthusiastically.  |
|                             | <b>2. Does your child listen when someone is speaking?</b>  | <b>Example: listen; wait and listen; look at who is talking for a longer period.</b>  |
| Observation of parents:     | MP5 answered "but only when is silent". The response was computed as yes.   | No comments.  |
| Observation of interviewer: | No comments.  | No comments.  |
| <i>Brainstorming:</i>       | No changes necessary.   | No changes necessary.   |
|                             | <b>3. When someone is speaking, does your child seeks the sound by turning his head toward the speaker?</b>   | <b>No examples on the questionnaire.</b>  |
| Observation of parents:     | No comments.  |   |
| Observation of interviewer: | No comments.  | Even with no examples the parents were able to answer.<br>Would you add an example?   |
| <i>Brainstorming:</i>       | No changes necessary.   | No changes necessary.   |
|                             | <b>4. Is your child interested in toys that produce sound or music?</b>   | <b>Example: Rattle; squeezing toys</b>  |
| Observation of parents:     | No comments.  | In this example, to complete their answers, MP2 and M14 provided an additional example, "talking about the yellow chicken DVD". |
| Observation of interviewer: | No comments.  | No comments.  |
| <i>Brainstorming:</i>       | No changes necessary.   | No changes necessary.   |
|                             | <b>5. Does your child look for a speaker he is not seeing?</b>  | <b>No examples on the questionnaire.</b>  |
| Observation of parents:     | No comments.  | No comments.  |
| Observation of interviewer: | No comments.  | No comments.  |
| <i>Brainstorming:</i>       | Does your child look for a person he is not seeing?   | No changes necessary.   |

For the amount of questions with doubts about explanatory variables hearing age (months), chronological age (months), SII and LittlEars®, a multiple linear regression model was fitted in order to verify whether there was a linear relationship of the response variable with the explanatory variables. Only the hearing age variable was statistically significant ( $p=0.04$ ). The parents of children with hearing age of 0 months had on average doubts in three questions and, as the hearing age increased by 5 units, the average number of doubts in questions increased by 1 unit.

In order to verify the existence of association, not necessarily linear, between the amount of questions with doubts and other variables that were not significant in the multiple linear regression model, the explanatory variables were categorized

for investigation of the difference between the average number of questions with doubts for each of these categories, through the one way F test of the analysis of variance model. It was observed that the average number of questions with doubts were similar in four categories of chronological age, which is confirmed by the p-value of the F test. Thus, there was no difference between the categories of chronological age, regarding the amount of questions with doubts. There was also no difference in the average number of questions with doubts among the categories of SII. This result was confirmed by the F test - p-value equal to 0.90. It was also noted that the average number of questions with doubts was very similar in the different categories of LittlEars®. The F test p-value was equal to 0.75, indicating no difference in the mean number of questions

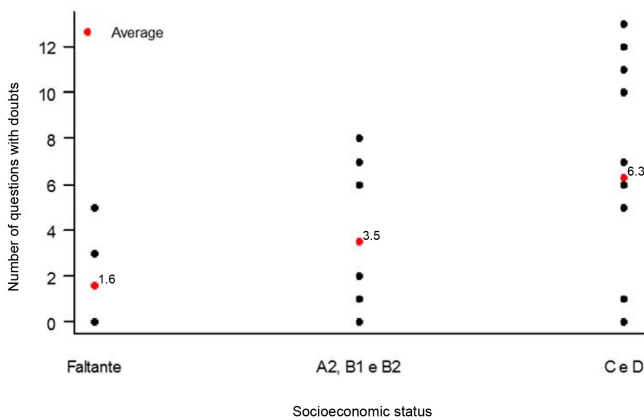




**Figure 1.** Relation between the number of people with difficulties on questions and number of people with difficulties on the examples (n=32)

with doubts among the categories of LittleEars®.

Apparently, there was an association between the amount of questions with doubts and the socioeconomic level, where parents classified as C and D levels would have presented greater mean number of questions with doubts compared with parents classified as A2, B1 and B2 and Missing. It might also be noted that the average for the category A2, B1 and B2 (3.5) was close to the average for the category Missing (1.6), which can be grouped (p value of equality test 0.40). The F-test comparing the average of Missing, A2, B1 and B2 (2,9) to the average of C and D (6,3) revealed a p value of 0.02, showing that the means were different (Figure 2).



F Test (p=0.02)

**Figure 2.** Distribution of number of questions with doubts according to socioeconomic status (n=32)

### Establishment of alterations by item, from the notes of parents and analysis of the group of experts

The items and examples that were most talked about and/or reported as greater difficulty by parents were also the most discussed at the meeting with the experts and have all been modified for better understanding of the questionnaire. In Question 1, six parents only understood the item after the given

example; in question 10, the expression “acoustic rituals” did not favor the comprehension of respondents, who only managed to respond to the item after the example being offered; in question 13, parents have reported which expression or word they had not understood, asked for the example and soon after were able to understand the item, however, the expression of the example “wall clock” was commented by 5 parents as “not having at home”. Thus, this example was discussed in the brainstorming and there was the need for modification. In question 16, eight parents reported not understand the expression “rhythmic movements” and only understood when the example was provided; in question 17, one respondent understood the word “event” as “party” and 11 other parents did not understand the item, but reported no difficulty. However, after the example they understood the question. Twelve parents did not understand question 18, however, after the example, they understood and were able to answer; in question 22, 13 parents were only able to respond to the item after being provided the example of the questionnaire, although difficulty with the question was not reported; in question 23, 13 parents only understood the item after the example was presented; in question 30, 12 parents did not understand the item before the example; twelve parents difficulties in answering question 34 and during the brainstorming there was the need for modification of the expression “control” by “orders”.

After the brainstorming session, modifications were not suggested to ten items (2, 3, 4, 7, 12, 14, 20, 21, 27 and 31), while the modifications deemed necessary for 25 items. Items that were the most commented by the parents guided the discussion among experts. Some items that were not commented by parents but identified as subject to doubt or ambiguity in the understanding were modified in the brainstorming activity.

### Analysis of the relation among SII 65 dB, hearing age and Littleears® performance

A multiple linear regression model was fitted for the variable LittleEars® and explanatory variables hearing age (months), chronological age (months), SII and socioeconomic status. Only hearing age and SII were significant. Children with hearing ages of 0 months and SII equal to 49 (SII average) have an average LittleEars® score of 14.5 (base profile). The increase in 1 month on hearing age caused an increase of 0.7 in the average score of Littleears®, maintaining constant the SII value. As to SII, the 1-point increase in SII scale led to an increase of 0.2 in the average value of LittleEars®, maintain constant the value of hearing age (Table 2).

These results seem to suggest that the translation used evaluates auditory skills.as that necessary explanations to the questions are provided.

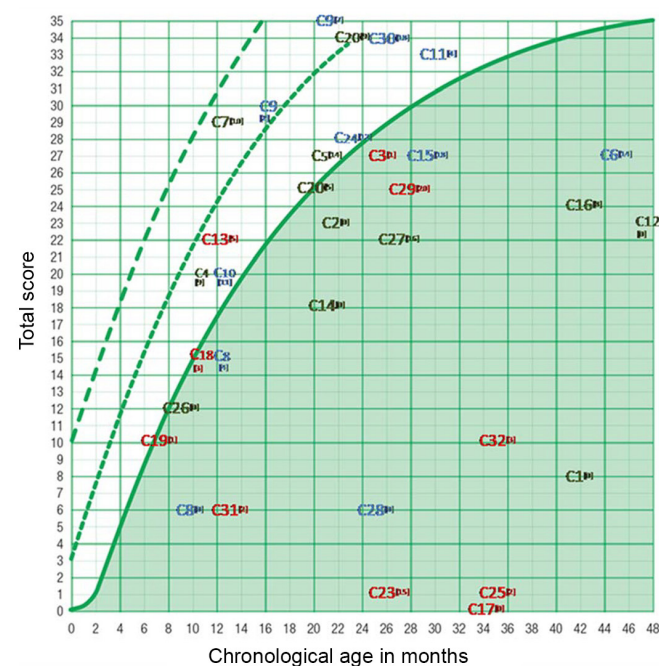
In the individual analysis from comparison with the scale of standard normal curve for children with normal hearing, the SII 65 dB, hearing age and chronological age were related

**Table 2.** Final model fitted for LittlEars®

| Variable             | Estimate | Standard error | p-value |
|----------------------|----------|----------------|---------|
| Socioeconomic status | 14.5     | 2.1            | <0.01   |
| Hearing age (months) | 0.7      | 0.2            | <0.01   |
| SII                  | 0.2      | 0.1            | 0.01    |

**Subtitle:** SII = Speech Intelligibility Index

to performance on LittlEars®. This seems to suggest that the questionnaire LittlEars® is able to assess the auditory development of children with hearing impairment, compared to SII 65 dB and hearing age. However, some children with SII 65 dB below 35% scored higher than expected and children with SII 65 dB between 36-55% and over 55% had scores as expected. Children who are in the SII 65 dB group below 35% are in red, children who are in SII 65 dB group 36% - 55% are in blue, and children who are in the SII 65 dB group above 55% are in green. Figure 3 describes each subject from comparison with the scale of standard normal curve for children with normal hearing regarding hearing age, chronological age and SII.



**Subtitle:** SII (65 dB) below 35% - red; SII (65 dB) 36-55% - blue, and SII (65 dB) above 55% - green (n=32)

**Figure 3.** Identification and distribution of subjects by hearing age (parenthesis), chronological age and SII regarding the standardized curve of LittlEars® for children with normal hearing

In the group of children with S II 65 dB below 35%, six children (C17, C19, C23, C25, C31 and C32) showed LittlEars® performance as expected. The other children in the group had higher than expected scores. It is believed that parents of children with low audibility for speech sounds have an unrealistic expectation.

In the group of children with SII 65 dB between 36% and 55%, children (C6, C8 and C28) were outside the normal parameter curve, but all had hearing age under four months; only C6 presented hearing age of 14 months but showed motor disorders, which probably justified this distance from the curve.

In the group of children with SII (65 dB) above 55%, children C1, C2, C12, C14, C16 and C27 were far from the normal parameter curve, because C1, C2, C12 and C14 had the hearing age of one week; C16 and C27 made little use of hearing aids, approximately 5 hours/day. Of the 32 children studied, two were not recorded in this figure as C21 is a user of CI and C22 had chronological age of 48 months and Figure 3 displays only subjects with chronological age up to 48 months.

## DISCUSSION

Regarding the preference for the form of instrument administration, four parents chose to respond to the questionnaire and 28 as interview. The original validation study of the auditory questionnaire<sup>(15)</sup> was performed on a questionnaire format as proposed by the authors of instrument. In this study, parents who opted for this type reported no difficulty with the written questionnaire, which is an advantage when the goal is to reach large numbers of people, even if they are scattered over a very large geographical area. However, one of the goals was to discuss the preference of parents regarding the response mode of parents from our service, as the socioeconomic status of the population is different from the countries in which the instruments were validated in the questionnaire format. It seems that the preference for instrument administration mode is related to the socioeconomic status of parents and probably many felt more confident about the interview option. The questions in the interview mode allowed the researcher to experience the difficulties and clarify them at the time of the interview. Some authors<sup>(22)</sup> reported that, for the use of the written material, there must be, between reader and author, the presupposition of a sharing of knowledge belonging to the same community, the world of knowledge and beliefs, assumptions that are realized through a lexical choice of the author.

In the analysis of the relationship between the variables number of people with difficulty with question and the number of people with difficulty with the examples - in which difficulty means comments, questions and / or suggestions - it became clear that, at various times, the vocabulary used was not known by parents or guardians. The difficulty of some parents to

understand some questionnaire items is justified by the linguistic knowledge on the use of language, as the lexicon, the organization of words, pronunciation, spelling, that is syntactic, morphological, phonological and orthographic knowledge<sup>(22)</sup>. The explanation for the fact that an illiterate person can not read is that it has no language skills required for the access code of the written text. Such knowledge is essential for readability and, according to the greater or lesser level of knowledge, the reader wins ease of processing code, gathering linguistic units into slices of information. Language skills then allow access to the text and the grouping of information presented.

There was an association between the amount of questions with doubts and socioeconomic status. Respondents were classified as belonging to C and D socioeconomic levels had higher average of number of questions with doubts in relation to respondents of A2, B1 and B2 classes. Even with a level of education favorable to reading, some parents could not understand some items, as educated people can not understand, for example, text with specific vocabulary. There is evidence that income and education are unevenly distributed in the world and the influence of socioeconomic inequalities in health status of populations has been evident, especially in developing countries<sup>(23)</sup>. In a census collected in 2010, it was estimated that 25.4% of the population are Class D in Brazil. In the present study, we identified more difficulty in understanding the items in the families of higher socioeconomic vulnerability. From these major doubts and/or difficulties encountered in the questions, it was necessary to change the items for better understanding and adaptation of the questionnaire for the population studied.

For the amount of questions with doubts about the explanatory variables hearing age (months), chronological age (months), SII and LittlEars®, a multiple linear regression model was initially fitted in order to verify whether there was a linear relationship of the response variable with the explanatory variables. Only the variable hearing age was statistically significant. This can be explained by the fact that before the child uses hearing aids, the family often does not observe auditory behaviors and may request clarification, instead of answering that the child does not show certain behavior. When parents discover that their child has a hearing loss, the first reaction is shock and they often do not accept this reality. At this stage, they do not have knowledge on the subject, which could justify parents of children with younger hearing age having fewer questions, comments and/or suggestions.

Concerning the results demonstrated relationship between SII 65 dB, hearing age, chronological age and LittlEars® performance, the LittlEars® Auditory Questionnaire is able to assess the auditory development of children with hearing impairment. A study<sup>(15)</sup> shows that there is a correlation between age and the total score, meaning the ability of the questionnaire to measure the age-dependent auditory behavior. The authors concluded that, in older children, higher scores are expected. However, as that

study included only children with normal hearing, performance was not related to SII and hearing age. In the present study, it was observed that the increase in LittlEars® score remained constant with the values of the SII and hearing age.

The cultural equivalence is an essential step in the validation of protocols. It is through cultural adaptation that a translated questionnaire can be directed to the population of the language in question. The version presented in Appendix 1 developed from in this study sought adaptation and semantic/cultural validation for Brazilian Portuguese. The suggestions raised during the interviews and questionnaires were discussed during the expert brainstorming activity, most of which was accepted, improved and endorsed by the group in the construction of the proposed version attached. The equivalence with the original version should be analyzed in a larger population. The continuity of the validation process - from semantic analysis and validation of this instrument for the Brazilian Portuguese - allow its use in clinical practice and research, as the experience through the steps to validate a protocol helps to understand the common aspects of patients with hearing age of up to two years. Future research with LittlEars® should perform the comparison of results, since the use of a standardized and validated instrument for our language allows comparative studies in different centers.

## CONCLUSION

Considering the type of application most parents preferred to answer the questions of LittlEars® in the interview mode, rather than written questionnaire as the original version, which suggests that in the studied population that is the preferred mode.

The questions, comments and/or suggestions in the questionnaire items presented by parents were related to vocabulary, idioms and unknown examples. The semantic adaptation seemed to ensure understanding of the studied population.

The results obtained from the LittlEars® questionnaire in the studied group varied according to hearing age and Speech Intelligibility Index (SII), which suggests that the translation has sensitivity to measure the auditory abilities considering it was interactive for clarification of doubts.

The semantic/cultural adaptation, an important step in the validation process LittlEars® questionnaire in Portuguese, was performed. Further studies are necessary to apply the new version and validation of the questionnaire to allow its use on measurement of auditory abilities on the evaluation processes in hearing health services.

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**Appendix 1. LittlEars® – Auditory questionnaire: questionário para pais para avaliar comportamento auditivo – Adaptação Semântica**

Este questionário auditivo foi desenvolvido para avaliar desenvolvimento auditivo em crianças ouvintes e em crianças com deficiência auditiva após o implante coclear (IC) ou adaptação de aparelhos de amplificação sonora individual (AASI). Abrange desenvolvimento auditivo nos primeiros dois anos pós IC ou adaptação de AASI (até a idade auditiva de dois anos) ou em crianças ouvintes até 2 anos de idade. O questionário inclui perguntas sobre respostas auditivas que dependem da idade e apresentam complexidade crescente. Portanto, com crianças mais novas, poucas questões terão a resposta “sim”.

Como completar o questionário?

Todas as perguntas devem ser respondidas marcando a alternativa “sim” ou “não”.

Por favor, marcar:

- SIM: se você já observou este comportamento em seu filho pelo menos uma vez.
- NÃO: se você nunca observou este comportamento ou não tem certeza.

Se você responder 6 “não” para uma criança ouvinte, não é necessário continuar respondendo o questionário. Essas perguntas serão consideradas como “não”.

Para crianças com AASI ou IC, todas as questões devem ser respondidas, visto que comportamentos auditivos descritos nas demais perguntas podem ser observados.

Serviço:

Paciente: \_\_\_\_\_ Idade: \_\_\_\_\_

Para crianças com AASI ou IC:

Data da cirurgia: \_\_\_\_/\_\_\_\_/\_\_\_\_ OD/OE

Data 1ª ativação: \_\_\_\_/\_\_\_\_/\_\_\_\_ Data adaptação dos AASI: \_\_\_\_/\_\_\_\_/\_\_\_\_

Data 2ª cirurgia: \_\_\_\_/\_\_\_\_/\_\_\_\_ OD/OE

Data 2ª ativação: \_\_\_\_/\_\_\_\_/\_\_\_\_

Idade auditiva: \_\_\_\_\_

\*Cálculo da idade auditiva:

Crianças com audição normal: idade auditiva igual idade cronológica

Criança com IC: intervalo de tempo desde a ativação do primeiro processador. Se a primeira ativação não é conhecida: tempo decorrido desde a cirurgia menos 1 mês.

Criança com AASI: intervalo de tempo desde a adaptação do AASI.

Outras perguntas de interesse:

1 – Você já observou nele alguma resposta para sons ou vozes que eu não perguntei nesse questionário?

2 - Nas últimas duas semanas, seu filho escutou algum som ou alguma palavra que ele não escutava antes e surpreendeu você ou a sua família?

Obrigada por preencher o LittlEars® Questionário Auditivo!

|   | Pergunta sobre resposta auditiva  | Respostas | Exemplo  |
|---|---|-----------|--|
| 1 | Seu filho responde para uma voz de alguém conhecido?  | Sim Não   | Sorri; olha para quem falou; fala entusiasmado.  |
| 2 | Seu filho escuta quando alguém está falando?  | Sim Não   | Escuta, espera e escuta: olha para quem fala por um período longo.                             |
| 3 | Quando alguém está falando, seu filho procura o som virando a cabeça na direção de quem fala? | Sim Não   |  |
| 4 | Seu filho se interessa por brinquedos que produzem som ou música?                             | Sim Não   | Chocalho, brinquedos de apertar  |
| 5 | Seu filho procura por uma pessoa que está falando e que não está vendo?                       | Sim Não   |  |
| 6 | Seu filho escuta quando algum aparelho de som está ligado?                                    | Sim Não   | Escuta: olha para a fonte sonora; fica atento; dá risada ou canta/conversa junto com a música. |
| 7 | Seu filho responde para sons distantes?   | Sim Não   | Quando é chamado de uma outra sala   |
| 8 | Seu filho para de chorar quando você fala com ele sem ele estar vendo você?                   | Sim Não   | Você tenta acalmar a criança com uma voz ou música suave, sem contato visual.                  |
| 9 | Seu filho responde com alarme (susto) quando ouve uma voz de uma pessoa irritada?             | Sim Não   | Fica triste e começa a chorar.   |

|    |  |     |     |  |
|----|--|-----|-----|--|
| 10 | Seu filho reconhece (antecipa) situações do dia a dia somente pelo som (rituais acústicos)?                            | Sim | Não | Canção de ninar; música da novela; propaganda de TV.   |
| 11 | Seu filho procura por sons que estão à sua direita, esquerda ou atrás?   | Sim | Não | Você chama ou diz alguma coisa; latido do cachorro, etc. e a criança olha e encontra a fonte sonora.                                   |
| 12 | Seu filho reage ao próprio nome?   | Sim | Não |  |
| 13 | Seu filho procura por sons localizados acima ou abaixo dele?   | Sim | Não | Alguma coisa que caiu no chão, ou uma porta batendo.   |
| 14 | Quando o seu filho está triste ou mal humorado, ele pode ser acalmado ou mudar de comportamento na presença de música? | Sim | Não |  |
| 15 | Seu filho escuta ao telefone e parece reconhecer que alguém está falando?  | Sim | Não | Quando a vovó ou papai liga. A criança pega o telefone e “escuta”...   |
| 16 | Seu filho responde para a música com movimentos rítmicos (dançar)?   | Sim | Não | A criança movimenta braços e pernas ao som da música   |
| 17 | Seu filho sabe que um certo som é relacionado a um determinado objeto ou acontecimento?                                | Sim | Não | A criança ouve o som do avião e olha para o céu; ou escuta o barulho do carro e olha para a rua.                                       |
| 18 | Seu filho responde apropriadamente para frases simples e curtas?   | Sim | Não | Pare! Não pode! “Eca”?   |
| 19 | Quando você fala “Não” fortemente, mesmo que a criança não veja você, ela para o que está fazendo?                     | Sim | Não | Quando fala “Não” fortemente, mesmo que a criança não veja você, É efetivo (funciona).   |
| 20 | Seu filho reconhece nomes dos membros de sua família?  | Sim | Não | Onde está o papai, mamãe, Marcos...  |
| 21 | Seu filho imita sons quando é solicitado?  | Sim | Não | “aaaa”, “oo”, “M”  |
| 22 | Seu filho segue ordens simples?  | Sim | Não | Venha cá! Tire os sapatos!   |
| 23 | Seu filho compreende perguntas simples?  | Sim | Não | Cadê a barriga? Cadê o papai?  |
| 24 | Seu filho vai buscar objetos quando é solicitado?  | Sim | Não | Pega a bola, etc.  |
| 25 | Seu filho imita sons ou palavras que você fala?  | Sim | Não | Fala: auau ; Fala: carro.  |
| 26 | Seu filho faz o som correto para cada brinquedo?   | Sim | Não | BRUMM para o carro, muuu para a vaca.  |
| 27 | Seu filho sabe que determinados sons correspondem a determinados animais   | Sim | Não | Auau para cachorro; miau para gato; cocó para galo   |
| 28 | Seu filho tenta imitar sons do dia a dia?  | Sim | Não | Sons de animais, sons de equipamentos domésticos, sirene do carro de polícia.  |
| 29 | Seu filho repete corretamente sons de fala curtos e longos na mesma ordem que você fala?                               | Sim | Não | La, la, laaa   |
| 30 | Seu filho pega o objeto correto entre vários outros quando solicitado?   | Sim | Não | Vocês estão brincando com brinquedos de animais e pede o “cavalo”. Vocês estão brincando com bolas coloridas e pede a “bola vermelha”. |
| 31 | Seu filho tenta cantar junto quando ouve uma música?   | Sim | Não | Músicas infantis ou parlendas (1, 2 feijão com arroz...)   |
| 32 | Seu filho repete algumas palavras quando você pede?  | Sim | Não | Diga: “Oi” para vovó   |

|    |  |     |     |   |
|----|--|-----|-----|---|
| 33 | Seu filho gosta quando alguém lê história para ele?    | Sim | Não | Um livro infantil, ou livro de figuras.                   |
| 34 | Seu filho segue ordens complexas?                      | Sim | Não | Tire seu sapato e venha cá!                               |
| 35 | Seu filho tenta cantar quando ouve músicas familiares? | Sim | Não | Canção de ninar; Galinha Pintadinha; Palma, palma, palma. |

|   |  |
|---|--|
| Pontuação total: todas as respostas assinaladas SIM |  |
|---|--|