

## Validation of results of the Polish version of the LittleEars questionnaire

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### Introduction

The introduction of pediatric cochlear implantation has generated an interest in new assessment measures of auditory-verbal and language abilities of young children, as well as in benefits of new emerging technologies. There is a growing need for instruments to appropriately monitor auditory behavior in very young children, who are exposed to different languages and cultures. This need is more evident since the benefits of early detection and intervention in children with different types of hearing loss have been documented in various studies. Parental questionnaires can be useful instruments for complementing professional assessments carried out before and after cochlear implantation in formal clinic contexts. The trend toward very early cochlear implantation at the age of 12 months or earlier, has necessitated the development of parental questionnaires that could be used at a very early age.

One such instrument is the LittleEars questionnaire, developed to assess the auditory behavior of infants up to two years of age (Weichbold et al., 2005). The questionnaire consists of 35 dichotomous questions. Most of the items are additionally supplemented with examples to make the questions more precise. Parents were asked to respond items: 1) “yes”, if they have observed the behavior in their child at least once, or 2) “no”, if they have never observed the behavior or if they are not sure how to answer the question. The total score of the questionnaire is the sum of all “yes” answers to the questions.

To interpret the results, the total score is compared with two critical values: expected and minimum. The expected value is an average score for the particular child’s age. The average

scores for each month of age were calculated on the basis of the results obtained in children from the group in validation process. The minimum value is the lower limit of the 95% confidence intervals (unilateral) from the validation sample. The comparison with critical values facilitates the assessment of the stage of a child's auditory development and allows to calculate his/her auditory age (Weichbold et al., 2005). It was also intended to follow the auditory development of very young hearing impaired children: cochlear implant or hearing aid users, with a hearing age (time after first fitting of the devices) of 0-24 months (Kuehn-Inacker et al., 2003). The psychometric properties of the original version of the LittleEars questionnaire support its use as an assessment instrument for evaluating auditory behavior in normally hearing children up to the age of 24 months (Weichbold et al., 2005).

Professionals involved in cross-cultural assessment have acknowledged the methodological challenges which they face when translating and adapting questionnaires developed for a specific linguistic and cultural group. To start with, the original items may have different meanings when translated into another language or there may be words or expressions which have no equivalent in another language (Crowe, 2005). The belief that "anyone who knows the two languages can produce an acceptable translation of a test" is regarded by the experts as a myth (Hambleton and Patsula, 1999). On the other hand, there is substantial evidence that a good translation process does not guarantee that the questionnaire score will be reliable and valid in a second language or culture (Crowe, 2005; Hambleton and Patsula, 1999).

The aim of this study is to evaluate the psychometric properties of the Polish version of the questionnaire.

## **Material and method**

310 parents of children with normal hearing aged between 0.47 and 24.00 months were assessed using the Polish version of the LittleEars. The mean age of children was 16.46 months. 138 girls and 172 boys participated in the study. The data were collected in day nurseries and pediatric clinics by staff from the Institute of Physiology and Pathology of Hearing, specially trained in the task of questionnaire distribution (Obrycka et al., 2009).

To examine the psychometric characteristics of LittleEars items, item analyses were performed. Along with descriptive statistics (mean and standard deviation), corrected item - total correlations were calculated to analyze to what extent items distinguish levels of

intended construct (Nunnally and Bernstein, 1994). Cronbach's alpha coefficient was estimated to assess internal consistency of responses to items. The higher the alpha coefficient is, the more reliable measurements are, with reliability understood as the consistency of answerers to items provided by the subjects. A Cronbach's alpha value of more than 0.70 indicates good reliability (Nunnally and Bernstein, 1994).

Lastly, the regression of the total scores to age was calculated to obtain expected and minimum values by means of the least square method. Obtaining expected and minimum values was necessary to get significant normative data of the Polish LittleEars questionnaire for Polish children. All statistical analyses were performed using the SPSS version 16.0 of the program package.

## **Results**

The mean values of the answer to the questions range from 0.31 to 0.99. As the response format of the LittleEars item is dichotomous, the mean values can be considered difficulty indexes. The difficulty index represents percentage of children whose parents answered "yes" to the item. The first four items have the lowest difficulty indexes (0.99 - 0.97), whereas the last four items show the highest indexes (0.31-0.60). The mean values indicate mostly that the LittleEars items have been sorted by their difficulty indexes. Figure 1 shows the distribution of the mean responses to the items

The obtained values of corrected item - total correlations range from 0.14 to 0.84. Due to their lowest difficulty indexes, the first four items have the lowest corrected item - total correlation values. All items but 9 have values higher than 0.50. The Cronbach's alpha coefficient value is 0.95, indicating that the answers are highly consistent. Taking together the corrected item - total correlation and the Cronbach's alpha coefficient values, the LittleEars items can distinguish efficiently the level auditory development of the assessed children. Figure 2 shows the distribution of the corrected item - test correlations.

The correlation values between item scores and age extend from 0.14 to 0.82. The lowest correlation values correspond to items from 1 to 4. Since these items are intended for measuring auditory behavior that even very young children can show, they have weak correlation with age. On other hand, the value of correlation between total scores and age is 0.90 ( $p < .001$ ).

The high value achieved by correlation between total scores and age, allows us to feel confident that the Polish version of the LittleEars questionnaire provided measurement which reflects the theoretical relationship between auditory development and age.

Due to the reduced size of the sample, it was considered more suitable to calculate the expected and minimum values by means of the regression of total scores to age. Under a nonlinear regression model, the total scores were the dependent variables, whereas age was the independent variable. The results show that the "age" variable contributes significantly to the model of "total scores". The predictive model can be presented by the following general equation:  $y = -0,028x^2 + 1,9837x - 4,8536$ . The coefficient of determination for the nonlinear model shows that 83% of the variation in the total scores can be explained by age ( $R^2 = 0,83$ ).

The expected and minimum values were calculated using the results of the regression analyses. Table 1 shows the expected and minimum values for children from 0 to 24 months.

## **Conclusions**

The results of psychometric analyses support the use of the Polish version of the LittleEars questionnaire as a sensitive and reliable tool to assess the development of auditory behavior in Polish children between 0 and 24 months of age.

Future research should be performed to get evidence on the utility of the Polish LittleEars to follow-up studies with children that wear hearing aids and cochlear implants.

## **References**

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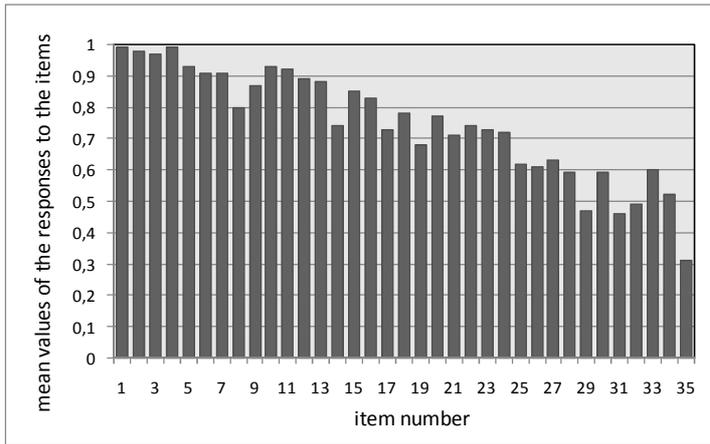


Figure 1. The distribution of the mean responses to the items

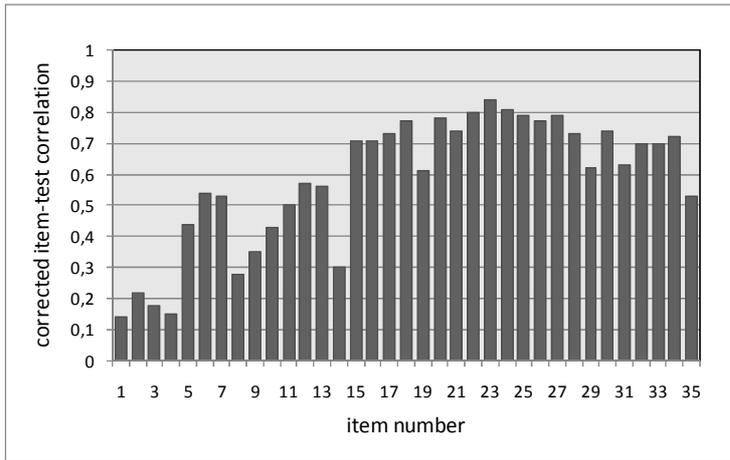


Figure 2. The distribution of the corrected item-test correlations

Table 4. Expected and minimum values

Age (month)	Expected value	Minimum value	Age (month)	Expected value	Minimum value
0-1	3.4	0.0	12-13	22.6	15.6
1-2	5.3	0.0	13-14	23.9	16.8
2-3	7.1	0.0	14-15	25.1	18.0
3-4	8.9	1.7	15-16	26.2	19.2
4-5	10.7	3.5	16-17	27.3	20.2
5-6	12.4	5.2	17-18	28.3	21.3
6-7	14.0	6.9	18-19	29.2	22.3
7-8	15.6	8.4	19-20	30.1	23.2
8-9	17.1	10.0	20-21	31.0	24.0
9-10	18.6	11.5	21-22	31.8	24.8
10-11	20.0	12.9	22-23	32.5	25.6
11-12	21.3	14.2	23-24	33.2	26.3