RECOGNITION OF PORTUGUESE SENTENCES LISTS TEST IN SILENCE AND NOISE VERSUS BENEFITS FOR CHILDREN AND TEENAGERS USING HEARING AIDS

Reconhecimento de sentenças no silêncio e no ruído versus benefício de crianças e adolescentes usuários de próteses auditivas

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ABSTRACT

Purpose: to evaluate children and teenagers musing hearing aids, investigate the benefit provided by sound amplification, through the Portuguese Sentences Lists Test and a benefit assessment questionnaire for children and teenagers; and to check the correlation between the results obtained from these two instruments. **Method:** 13 children and teenagers, between eight and 14 years old, both sexes, with a moderately severe hearing loss as the maximun level on the best ear, hearing aids users bilaterally for more than ten months and fitted by a Hearing Health Program were evaluated. An anamnesis was applied, then the subjects were submitted to a basic audiological evaluation, and were evaluated by the Portuguese Sentences Lists Test and a benefit assessment questionnaire for children and teenagers. **Results**: the results obtained from the Portuguese Sentences Lists Test and the questionnaire showed the subject's benefit with the use of the hearing aids, both in silence and in noise. However, there was no statistically significant correlation between these two instruments. **Conclusion:** although statistically significant correlation has not been verified between the results obtained using two assessment instruments, through the Portuguese Sentences Lists Test, the individuals had improvement in the performance of speech recognition, using the hearing aids, both in quiet and in noise, and in response to the questionnaire, the subjects reported benefit with the use of sound amplification.

KEYWORDS: Child; Hearing Loss; Hearing Aids; Speech Perception; Questionnaires

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INTRODUCTION

Hearing is the sense that promotes the human communication[1]. The processes of language and learning are very complex, involving networks of neurons that are distributed in different regions of the brain and that relate themselves to the speech perception, being dependent on the peripheral and central hearing integrity[2].

Hearing loss is defined as a reduction in hearing at any level that reduces the intelligibility of the spoken message to the accurate interpretation or to the learning[3].

When it is manifested in childhood, the hearing loss, even being in a small level, can cause learning difficulties, problems with language development and behavioral disorders. Hearing loss in childhood is an important public health problem, because of its frequency and also because of the great linguistic, educational and psychosocial damage that it can determine[3].

To minimize the negative effects of hearing loss, hearing aids have been developed, which are considered the key component of rehabilitation. The amplification that is provided by hearing aids are not only delimited to speech sounds, but they also incorporate environmental sounds, danger and warning sounds and other ones that are presented in the life of the user of this apparatus, besides facilitating education and also the psychosocial and intellectual development of the individual with hearing loss[4].

The use of hearing aids is a great chance to modify the progress of relationship of the hearing impared child with the environment they live in, but to be considered well-suited, the prosthesis should offer benefits to the user[5]. Therefore, it is the speech therapist the responsible to evaluate the benefits and limitations of the listening skills of children and teenagers by using the hearing aid, ie, what are the effects of the sound amplification in the quality of life of these individuals[6].

To verify the benefits of hearing aids in the quality of life of children and young people, the speech therapist can use procedures, such as: observing the behavior of the child in response to the signal amplification that is provided by hearing aids, quantifying the behavioral responses of children by using the amplification through the functional gain and speech perception tests (direct measurements), and also analyzing the indirect measures of the obtained child performance in interviews with parents, caregivers and/or educators by using a questionnaire that was developed for this objective[6].

The most used tests for speech recognition, usually, use single words as stimuli, such as the Monosyllables List test for vocal discrimination[7], which is used in Brazil, and PAL PB[8] and CID W 22 tests[9], used in the United States[10]. However, tests of speech recognition of isolated words do not attend the need to assess the individual in a situation that resembles that experienced on a daily routine because they provide fragmented information of the hearing system operation[11]. On the other hand, tests that use sentences as stimuli to assess the auditory behavior of the individual in situations closer to those of his/her daily routine.

Once they constitude the best instrument to assess the communication of individuals in their daily activities, with or without hearing aid, there were tests that use speech as a stimulus in frequently used sentences. The performance of the individual in recognition of these phrases gives us a direct measure of how he is able to participate in a conversação[12]. Having in mind these considerations, it was developed the Portuguese Sentence Lists (PSL) test[13], which evaluates the sentences with speech recognition in quiet and in noise environments, and provides information about the real capacity of communication with patients.

The speech recognition tests are, sometimes, used for evaluation in adults, however, in children and teenagers these tests that assess speech recognition in quiet and in noise environments, can show auditory perceptual difficulties, such as: show improvements arising from the use of amplification. Considering these facts, it is noticed the need to assess this population with a sensitive material, that could also provide qualitative data about the ability of the pacients to communicate with.

Hearing assessment in children and teenagers, by using sentences as stimuli, both in silence and in noise, is not yet part of the audiological routine that is used in Brazil. However, there are studies in the literature[14,15], in which children were evaluated using the sentences of the PSL as a stimulus. However, using this test in children and teenagers with hearing loss, the benefit to search through the use of sound amplification, is a groundbreaking work, since they were not found similar researches in the national literature.

For investigating the perception of the patient and family about the difficulties of communication, monitoring their progress and finding out his hearing needs not considering the standard audiometric battery, speech therapists can also use the scales and self-assessment questionnaires, which provide us quantifiable measures of perceived benefit and act as predictors of the difficulties that are faced by hearing aid users, assisting in the setting of themselves[16,17.]

Based on these purposes, the objectives of this research were to investigate the benefit provided by the hearing aid by means of the Portuguese Sentence List and Questionnaire assessment of the benefit in children and teenagers, users of hearing aids and verify if there is a correlation between the results which were obtained due to this two assessment tools.

METHOD

This study was conducted at the Laboratory of Hearing Services of the Speech Therapy Service (STS) from an institution of higher education in the period between May and August of 2009.

The studied patients were aided by the program of granted continuous flow hearing aids of the Secretary of Health Assistance of the Ministry of Health, through accreditation agreement between the Health Department of the State of Rio Grande do Sul and the institution of higher education, from 2005, based on the 587 and 589 ordinances, the Secretary of Health Assistance of the Ministry of Health, published in October 2004 and developed in that institution.

For the selection of individuals, it was used the following inclusion criteria: being between eight and fourteen years old, presenting a hearing loss of, at the most, moderately severe in the most affected ear (56 to 70 dB HL) [18], in order to make the answer to the recognition test sentences possible; having BTE hearing aids adapted, binaural and with an A, B, C technology, according to the suggested classification made by the Ministry of Health, in at least six months at the Laboratory of Hearing, through the program of granted hearing aids, said the higher education institution, accredited by the Secretary of Health Assistance of the Ministry of Health, as mentioned earlier.

The Exclusion criteria were: the presence of neurological disorders, the presence of cerumen stopper or other changes in the ear canal that could modify the performance in the test, or middle ear, in cases that presented tympanometric curve type B, inability to respond the test or difficulty to memorize the sentences of the Portuguese Sentence Lists (PSL) test [7].

Only individuals whose parents or guardians approved the necessary procedures to implement the research and signed an informed consent after having received clarification on the purpose and methodology of the proposed study made part in this study.

Then, based on these criteria, 70 patients were selected to be contacted and invited to participate and perform the evaluations.

Before the evaluations, otoscopy was performed, and a history applied to the patient and/or to their family member or guardian in order to investigate aspects related to personal data, education level of patients and frequency of use of the hearing aids. After, it was carried out the measurements of impedance and research of stapedial reflexes.

Next, it was verified the technical conditions of hearing aids, has been evaluated only those ones whose devices were in working order, granted on the basis of information given by the patient or family, and listening to the hearing aid by the evaluator, then the measures of functional gain, and evaluation of possible distortions with the aid of equipment verification of hearing aids.

After these procedures, patients who did not have cerumen or any change in external or middle ear that might interfere with testing, technical problems or prostheses, were tested for the thresholds of recognition of sentences in quiet and in noise (TRSQ and TRSN) and the Index Percentage of Sentence Recognition in Quiet and in Noise (IPSRQ and IPSRN) [13], in free field. These measurements were performed in the same assessment session, but the patient was evaluated without the use of hearing aids (TRSQ and TRSN, and IPSRQ and IPSRN) and then using the hearing aids (IPSRQ and IPSRN).

Some individuals were not able to respond to the recognition test sentences and were also excluded, and thus, the study group was composed of 13 subjects, four females and nine males; bilateral hearing aid users, more than ten months, with ages ranging from eight to fourteen years old, an average of 12.3 years old who were able to perform all evaluations.

To obtain the TRSQ, the TRSN, the IPSRQ and the IPSRN, it was used Portuguese Sentence Lists [13], which consisted of a list of 25 sentences, seven other lists with 10 sentences and a speech spectrum noise. The sentences and noise were recorded on a CD in independent channels.

To obtain the measurements of impedance, it was used the AZ impedanciometer, Interacoustics brand, and for the other evaluations, it was used a two-channel digital audiometer, Damplex brand, DA65 model and an amplification system for free field audiometry, TA 1010 model . The sentences were presented by using a CD player, British brand, B5279 model, in the lineout option attached to the audiometer.

The used procedure for the application of the test was based on the strategy named sequential or adaptive or even ascendent-descendent [19]. This allows determining the threshold for speech recognition, the individual level necessary to identify in a right way about 50% of the stimuli that were presented.

In a first moment, it was carried out a kind of training for the subjects to familiarize themselves with the test and approximate thresholds were obtained without the use of hearing aids. The top ten list of sentences 1A were applied to individuals before the obtaining of TRSQ and TRSN.

The research procedure of TRSQ and TRSN, without the use of hearing aids, was the presentation of a stimulus in a certain intensity, which was obtained after training to the test. If the individual was able to recognize in a correct way the speech stimuli presented, the intensity was decreased by the same set intervals. Otherwise, its intensity was

increased. This procedure was repeated until the end of the list. The TRSN was investigated with a constant noise intensity of 65 dB SPL (A). It was used 4 dB intervals until the first change in the type of response, and then the intervals of stimulus presentations of 2 dB from each other until the end of the list [19].

It is important to mention that the TRSQ and TRSN were not analyzed in this study, they were obtained with patients without hearing aids, only as a basis to establish the intensity at which they should be investigated IPSRQ and IPSRN with and without hearing aids.

Therefore, in the researches of IPSRQ and IPSRN the intensity of sentence presentation was based on theTRSQ and TRSN respectively, of each individual, ie, to search IPSRQ, the speech was set in the intensity, which was obtained the TRSQ and then presented all sentences from a list. Subsequently, it was calculated the percentage of correct this condition by list. While, for the measurement of IPSRN was set at Q/N relation in which the TRSN and then presented each of the sentences, so that was also calculated the percentage of correct answers in a Q/N fixed relation. In the reseaches of noise, that remained constant at 65 dB SPL (A).

This strategy was used to obtain the IPSRQ and IPSRN without the use of hearing aids, and then, with the use of hearing aids, and then it was calculated the difference between the percentage of correct answers obtained in both conditions, which helped to measure the benefit in referred to the speech recognition with the use of hearing aids.

The measures were investigated in an open field after proper calibration of the equipment, by a registered professional of Inmetro/SP in order to establish the sound pressure level of speech and noise, given the characteristics of the test signal and the acoustic conditions of the environment. For this proposal, it was used the B & K 4144 n / s Microphone, B & K 2260 n /s Sound Pressure Level Meter and a B & K n / s Sound Pressure Level Calibrator. The meter was positioned at a midpoint between the two ears, with a distance of one meter from the speaker.

The VU-meter audiometer was placed at the 0 position before each assessment and each CD channel was calibrated separately, being a pure tone of 1000 Hz used to calibrate the channel of the sentences. The use of pure tone is necessary because speech is a complex sound that presents a range of 30 dB between the more intense and less intense sound, ranging above 12 dB and 18 dB below the average [20]. Therefore, the use of a continuous tone of reference keeps the same conditions of presentation. Since the channel noise was calibrated by using the own noise recorded on another channel.

It was used a digital sound pressure level meter (SPL), Radio Shack brand, periodically, in order to monitor the levels of presentation of different stimuli, always determining and ensuring the same acoustic conditions in the free field for all the evaluated subjects.

Then, finally, the benefit provided by amplification, in patients aged between eight and fourteen years old, was investigated by using a Questionnaire of Assessment of the benefit of ISAA in Children and Teenagers [21]. This instrument contains closed questions, which are together with illustrative pictures for the benefit provided by hearing aids in the residential environment, school and social life. This questionnaire was answered by the patient.

The questionnaire is made of 11 questions, which were assigned points. Each of the closed answers for each item were scored with ‘2 ‘(for the “yes” answer), ‘1 (for the “a little bit” answer) and ‘0’ (for the “no” answer), in a way that the maximum score for the quiz is 22 points and a minimum of zero, which indicates that the higher the test score, the greater are the benefit noticed by the user.

The questions were identified by letters. Letter “A” which refers to the question of the residential environment, the questions “B” correspond to the”school” environment and the questions “C” correspond to the “social” environment.

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SKtest test was used to investigate the distribution of the sample. The Paired T test was used to analyze the significance in the performance of participants in the research of IPSRQ and IPSRN, with and without the use of hearing aids. The level of rejection of the null hypothesis was set at a value less than or equal to 5%. In the tables, the statistical results were marked with an asterisk (*) when significant.

The test of Pearson’s correlation coefficient was used to verify the existence of correlation between the IPSRQ and IPSRN, with and without the use of hearing aids in both cases, with the average score obtained in the questionnaire.

RESULTS

It will be presented in the tables: the data concerning the time of use of hearing aids, the results of measurements obtained with the Speech Recognition Test (SRT) and the results that were obtained from the Questionnaire of Assessment of the benefit of ISAA in Children and Youth people.

Table 1 – Time of daily use of the hearing aids

Time of daily use of the hearing aids	%	N= 13
0 to 4 hours	7,70	01
5 to 8 hours	46,20	06
9 to 12 hours	30,80	04
More than 12 hours	15,40	02

Obtained Results with the SRT

In table 2, it is possible to find the average values and medians of IPSRQ and IPSRN, with and without the use of hearing aids, as well as the minimum and the maximum presented values in this same research. The SKtest test showed that the data presented a normal distribution.

Table 2 – Values of average, median, standard deviations, minimum and maximum limits of IPSRQ and IPSRN and presented in percentages and Test of Normality

N=13	Average %	Median %	DP %	Min %	Max %	Sktest	Value of p
IPSRQwo	63.08	70	17.50	40	90	0.1926	0.0023*
IPSRQw	83.08	90	16.01	60	100	0.1793	
IPSRNwo	41.54	40	12.14	20	60	0.4891	0.0001*
IPSRNw	69.23	60	19.35	40	100	0.5454	

* statistically significant value p≥0,05

Caption: IPSRQwo: Percentage rate of recognition of sentences in silence without hearing aids.
IPSRQw: Percentage rate of recognition of sentences in silence with hearing aids.
IPSRNwo: Percentage rate of recognition of sentences in noise without hearing aids.
IPSRNw: Percentage rate of recognition of sentences in noise with hearing aids.

Results obtained with the Questionnaire of Assessment of the benefit of ISAA in Children and Youth people

Table 3 shows the scores that were obtained in each of the questions, as well as the total score per individual and the total score per question.

Correlation between the results of SRT and of the Questionnaire of Assessment of the benefit of ISAA in Children and Youth people

Table 4 shows the result of the average scores that were obtained in the questionnaire relating them to the IPSRQ and IPSRN, with and without the use of hearing. It also shows the correlation between the differences of results that were obtained with and without the use of hearing in the context of silence and in the context of noise. In all cases there was no statistically significant correlation.

Table 3 – Obtained Score in the Questionnaire of Assessment in the benefit of ISAA in Children and Youth People

A 1	A 2	A 3	B 1	B 2	B 3	B 4	C 1	C 2	C 3	C 4	Pont ind
2	2	2	#	#	#	#	2	2	2	2	14
2	2	2	2	2	2	2	2	2	2	1	21
2	2	2	2	2	2	2	2	2	2	2	22
2	1	2	2	1	2	1	1	1	2	0	15
2	2	2	2	2	2	2	2	2	2	1	21
2	2	2	2	2	2	1	#	2	2	1	18
1	1	1	2	2	2	2	#	#	1	1	13
2	2	2	2	2	2	2	2	2	2	0	20
2	2	2	2	2	2	2	2	2	2	2	22
2	2	2	1	2	2	2	2	2	2	2	21
2	2	2	2	2	2	2	2	2	2	2	22
2	2	2	2	2	2	2	2	2	2	2	22
2	1	2	2	2	2	1	2	2	1	2	19
25	**23**	**25**	**23**	**23**	**24**	**21**	**21**	**23**	**24**	**18**	**19,23**

without answer.

Table 4 – Correlation between IPSRQ and IPSRN (with/without the aid and difference) and average score of the questionnaire

	Correlation of Pearson
IPSRQwo	-0.1163
IPSRQw	0.2739
IPSRQdif	0.3085
IPSRNwo	-0.0944
IPSRNw	0.2287
IPSRNdif	0.2967

* statistically significant value p≥0,05

Caption: IPSRQwo: Percentage rate of recognition of sentences in silence without hearing aids.
IPSRQw: Percentage rate of recognition of sentences in silence with hearing aids.
IPSRNwo: Percentage rate of recognition of sentences in noise without hearing aids.
IPSRNw: Percentage rate of recognition of sentences in noise with hearing aids.

Table 5 shows the results of the correlations between the average scores that were obtained in each of the questions with the questionnaire and IPSRQ and IPSRN with and without the use of hearing aids, as well as the correlation between the differences of the obtained results, with and without the use of hearing aids, in the context of silence and also in the context of noise. The results show random correlations.

DISCUSSION

From the obtained results, it will be discussed some issues related to them.

In relation to the daily time of use of hearing aids, a significant number of subjects (46.2%) reported to make use of them during five to eight hours a day, which is more than one shift daily.

Table 5 – Correlation between IPSRQ and IPSRN (with/without the aid and the difference) X score per question

Corr	A1	A2	A3	B1	B2	B3	B4	C1	C2	C3	C4
IPSRQwo	0.2245	0.2088	0.2245	-0.2445	0.3239	-0.4621	-0.4729	0.0334*	0.3117	0.0780	0.0906
IPSRQw	0.4330	0.4656	0.4330	-0.4410	-0.0935	-0.3175	-0.1169	0.5109	0.6013	0.2239	0.2346
IPSRQdif	0.1443	0.1826	0.1443	-0.1336	0.2004	0.1443	0.3077	0.3649	0.2004	0.1066	0.1043
IPSRNwo	0.0381*	0.3702	0.0381*	-0.2908	-0.1762	-0.2094	-0.3409	-0.1100	0.0529	0.1265	0.5568
IPSRNw	0.2986	0.0843	0.2986	-0.4479	-0.2322	-0.4778	-0.1579	0.5954	0.4866	-0.0970	0.5263
IPSRNdif	0.2831	0.4360	0.2831	-0.2735	-0.1254	-0.3570	0.0577	0.6846	0.4672	0.1818	0.1823

* statistically significant value p≥0,05

Caption: IPSRQwo: Percentage rate of recognition of sentences in silence without hearing aids.
IPSRQw: Percentage rate of recognition of sentences in silence with hearing aids.
IPSRNwo: Percentage rate of recognition of sentences in noise without hearing aids.
IPSRNw: Percentage rate of recognition of sentences in noise with hearing aids.

The adaptation of hearing aids is one of the basic conditions for the hearing impaired person to develop his potential, once he makes a full use of the device, that is, in all hours of day [22]. Using the instrument in more than two shifts of the day improves communication and promotes the development of relationships in hearing impaired people [23].

The same percentage (46.2%) of people reported to make use of the hearing aid between nine and twelve hours, or more than 12 hours a day, making the use of more than two shifts, which characterizes the effective use of the benefits that are described in the literature.

Hearing loss has a strong impact on the psychosocial life of patients with this deficiency. The possibility of using hearing aids in order to facilitate communication and minimize the difficulties caused by hearing loss can be significant for motivating and improving the quality of life of these individuals[24].

The patient awareness of the importance of the device in his life not only promotes the effective use of the device, but their conservation and maintenance [23].

During adolescence, according to the literature [23], the use of hearing aids, even being necessary, becomes a major concern for these individuals. But, there are some teenagers who do not deny the use of hearing aids because the benefit they obtain with them.

There is the possibility of occurring a growing intolerance for loud sounds of the environment in the first two months after the adaptation [25] and there is a reduction of this intolerance after six months, when there is an accommodation, ie, the user becomes used to these situations throughout the time that he makes use of amplification[21]. Thus, considering that some evaluations of this study were performed with the presence of noise, it is important that all patients were using hearing aids for over than ten months when they were evaluated.

When comparing the results obtained through IPSRQ and IPSRN, with and without the use of hearing aids, the measures showed statistically significant differences, indicating that performance with the use of hearing aids, compared to performance without the use of them, is much better, as the performance in a silence context, as compared to performance in noise one.

The results that were found, which evidenced an improvement in all subjects in front of a speech stimuli, both in quiet and in noise environments, are quite satisfactory, because when it starts a process of selecting and fitting hearing aids is expected that the individual is able to recognize, and environmental sounds, the speech stimuli, and thus, that he could be able to establish a satisfactory communication at any age. In the case of the analyzed population of this study, this is even more important, once it was evaluated children and teenagers who are in a school period.

This way, the more approximate the thresholds obtained with hearing aids thresholds of normality are, the greater are the chances of this individual to communicate effectively. However, it is important to note that the thresholds get just the opposite sounds without meaning is not a guarantee that a particular apparatus is helping the communication of this patient. Then, it is important to test the application of sentences to investigate the ability of speech recognition in conditions that simulate situations of real communication.

Besides, obtaining measures to evaluate speech recognition, in quiet and in noise contexts, is another factor to be highlighted.

In this study, it was found that an improvement in recognizing speech in noise was not as evident as in the silence context, which was the expected answer, once this task requires other skills.

He is quoted in the literature [26] that in a noisy environment, or adverse situations, the person may have lots of difficulties in speech intelligibility, because the number of clues fall down significantly, making them to use only clues that are available in the situation. So, it is emphasized the importance of testing in the presence of a noise context, once patients with the same abilities of speech recognition in silence may have different results in noisy environments.

Listening in noise is related to a high degree of effort [27] and with low speech intelligibility. In these contexts, it is necessary that the patterns of amplification of hearing aids are well adjusted to not cause hearing discomfort, which can lead users to give up the use of hearing aids in these situations [22].

One study [14] compared the speech recognition in quiet and in noise environments by children with and without learning difficulties and it was found an improvement in the performance of these children in the silence environment, when compared to the same performance in the noise one.

Another study [28] compared the performance in speech tests, with and without competitive noise, carried out with young and elderly individuals, and each group was made up by both individuals with normal hearing as well as with ISAA users with sensorineural hearing loss. The results were that as noise is increased, the performance of groups decreases. However the group of individuals with sensorineural hearing loss had worse results in the recognition of the message. The authors also verified that the users of hearing aids have improved

their income by making use of hearinh aids, in silence and in noise contexts.

In a study [15] analyzing the speech recognition in quiet and in noise in children with and without musical practice and different socio-cultural, it was noted that children with and without musical practice of the same socio-cultural group, showed similar performance in sentence recognition in quiet and in noise environments, as children with low socio--cultural showed worse performance than the children of a higher socio-cultural level, not considering the musical practice, the task of sentence recognition in quiet and in noise.

Therefore, all these studies show that when the evaluation is performed in situations that test, in addition to hearing, auditory skills, such as speech in noise and closing hearing, of each subject, and these individuals have any complicating variant; these results may be damaged, because it is a more complex task. In this case, it becomes even more evident because individuals who have hearing loss are involved, ie, the threshold of hearing is impaired, which will have important consequences in the evolution of skills, as well as the degree of commitment, must be considered the age of detection of disability and intervention.

The questionnaire for the assessment of benefit in children and young people [21] provided important information from the children, in relation to the benefits provided by the sound amplification in the auditory behavior of them in daily life situations.

Such information could not be obtained through the standard battery of tests, since these behaviors tend to occur at home and not in testing environments, which have an environmental sound control [29].

Because it is a questionnaire with easy access and it also has the help of illustrative pictures, it was answered without difficulty by most of the patients.

In relation to the benefits mentioned by 13 children, three of them reported fewer benefits than the others, which may be related to the daily use of hearing aids, once they reported to make use of them for less than six hours a day, ie, less than two shifts a day. However, these same children show a benefit when they were checked by testing for speech recognition, showing that the aid is with a good gain and it provides a benefit to them.

The non effective use of the hearing aid complicates the social integration, including the educational and occupational environments [30]. Thus, the greater time of acceptance and use of hearing aids are, the patient becomes more independent and integrated into their society and improve their quality of life.

It is known that the benefit of hearing aids is related to the improvement of communication in daily life, including the reduction of disability and hearing impairment [31]. It was observed that the environment in which children perceive greater benefit of having the hearing aid is the residential environment, where listening situations are more ideal, and secondly that the school environment was the place where occurred the greatest difficulty – hearing to what the teacher was saying – when the apparatus was off. This reinforces the need to orient themselves in the placement of the student near the teacher, because it favors the perception of the speech signal and reduces the interference from background noise [32].

The environment where children reported to present less benefit with the use of hearing aids was the social environment, especially to understand a person speaking in an environment with loud noise. In a noisy context the speech is not well understandable, difficulting, then, the reception of the spoken message. In these environments, it is also necessary that hearing aids are well regulated as not to cause hearing discomfort, which would lead the user to not use them in noisy environments [21].

After analyzing, individually, the results of objective and subjective measures of evaluation, they were correlated in order to register the benefit provided by hearing aids, taking into consideration the quantitative measures of the SRT and the opinion of the patients.

The results of IPSRQ and IPSRN, with and without hearing aids and the difference between them, were correlated with the average score of all questions of the questionnaire for assessment of the benefit of hearing aids in Children and Teenagers (Table 4). Despite being perceived an improvement in the performance through both evaluations, it was not found any statistically significant correlation between the data, which indicates that the improvement observed during the SRT, in silence and in noise contexts, with and without the use of hearing aids, does not correspond proportionately to the perceived benefit by patients in the questionnaire.

As reported in another study [33], the subjective tests aim to document the opinions and attitudes of patients once the objective results of the empirical procedures are used to verify the improvements in relation to the performances. Thus, successful adaptation of hearing aids depends on the analysis of the benefit that the prosthesis provides to the user, and these measures are increasingly important in any program of adaptation of hearing aids [34].

The use of the questionnaire to assess the benefit in children and teenagers [21], in order to evaluate the benefit provided by amplification of the point of view of the patients, is an effective tool to provide information about the benefit that provides hearing aids in situations of residential routine, school and social development in the evaluated children and teenagers.

In another study [35] no differences were found between the objective and subjective benefits provided by the hearing aid, in the assessment after a month, and held on after six months of the use of hearing aids.

A study [36] verified the need to use a protocol verification and validation as part of the nomination procedures and adaptation of hearing aids in children. And also, it was noted that procedures for speech perception can and should be performed by using familiar words and meaning, once familiarity with words can interfere with the performance improvement in the ratings.

As shown in Table 5, the results of IPSRQ and IPSRN, with and without hearing aids and the differences between them were also correlated with the score of each item of the questionnaire. There was no statistically significant correlation between most of the data, which indicates that the improvement that was observed during the test IPSRQ and IPSRN, with and without the use of hearing aids does not correspond proportionately to the perceived benefit by patients in the questionnaire. However, there was significant correlation between IPSRNs with questions related to the residential environment, specifically the question if the hearing aid helps to hear better to the TV and if it helps to hear better when parents talk to them, and the correlation of IPSRQs with the questions of the social environment, the question about if hearing aids help to play better with friends, which shows that the results are random, showing no fixed relationship between them.

The sound amplification through hearing aids compensate for attenuation of sound caused by hearing loss, but often the distortion caused by this deficiency is more difficult to be compensated. So, hearing aids improve speech perception in quiet conditions, due to this improvement in hearing ability by attenuation compensation [28], but it is believed that this improvement does not ocurr in a noise context by not always being able to fix the distortion in a satisfactory way.

A study[33] used three tests with sentences for speech recognition with the presence of background noise: Revised Speech Perception in Noise test (R-SPIN), QuickSIN and Hearing in Noise Test (HINT). These were compared to the Hearing Aid Performance Inventory (HAPI), which consists of a questionnaire to measure performance in speech perception and benefit through the use of sound amplification. In those analyses, it was found that the three tests of speech recognition, the patients showed better results in quiet and in noise environments when making use of hearing aids, compared to the results of the assessment without them. The comparisons between subjective and objective results indicated that, as documented in the classification in HAPI increased, performances on the R-SPIN, the HINT and QuickSIN also improved. However, correlations between objective and subjective results were not significant in all cases, suggesting that the sensitivity of HAPI and sentence recognition tests that were used vary according to specific items and procedures.

It is believed that these differences between objective and subjective tests are quite common and expected, once the questionnaires are made of questions that are related to expectation, and that is a measure that has many variants, which are directly related to the hearing or lack of its interferes with the life of the patient, emotional aspects and how he hopes that the hearing aid should meet the difficulties that are often not directly linked to it. Therefore, the patient may have an optimal response from the perspective of the evaluator, but consider it insufficient, once he – the patient – who overestimates the aid should offer the result. On the other hand, the opposite can also occur in less demanding and/or more realistic patients.

Therefore, this research reinforces the importance of using measurement instruments to monitor in an objective way, by testing speech recognition and subjective, through questionnaires, the result of amplification, especially in children and teenagers, as tests with sentences, when applied in quiet and in noise contexts, assess the communication of the patient in ideal situations and not ideal for listening, while the questionnaire allows to verify how the patient perceives the benefit provided by hearing aids in different situations of daily life, so that the speech therapist has greater security in relation to the use of a hearing ais, having concret evidence of the result of the intervention.

CONCLUSION

From IPSRQ and IPSRN established, it is possible to observe a better performance in sentence recognition by children and teenagers in situations that they make use of hearing aids, in quiet and noisy environments.

In the application of the questionnaire to assess the benefit, it was observed that in all the evaluated

items, most of the children and teenagers reported an improvement in performance with the use of hearing aids. Thus, it was verified a benefit provided by hearing aids in different situations of everyday life, considering the opinion of the pacient.

When comparing the results that were obtained with the test and the SRT self-assessment questionnaire, there was no statistically significant correlation between them, although there was found a good performance in both evaluations.

RESUMO

Objetivo: avaliar crianças e adolescentes, usuários de próteses auditivas, buscando investigar o benefício proporcionado pela amplificação sonora por meio do teste Listas de Sentenças em Português e do Questionário de avaliação do benefício em crianças e adolescentes, e verificar se existe correlação entre os resultados obtidos por meio dos dois instrumentos de avaliação. **Método:** estudo retrospectivo, onde foram avaliados 13 sujeitos com idades entre oito e 14 anos, de ambos os sexos, com perda auditiva de no máximo, grau moderadamente severo na melhor orelha, usuários de próteses auditivas bilateralmente há mais de dez meses e protetizados por um Programa de Saúde Auditiva. Foi realizada anamnese, nova avaliação audiológica básica e aplicados o teste Listas de Sentenças em Português e o Questionário de Avaliação do Beneficio em crianças e adolescentes. **Resultados**: os resultados obtidos no Teste de Listas de Sentenças em Português e no questionário mostraram que houve benefício com o uso das próteses, tanto no silêncio, quanto no ruído. Entretanto, não houve correlação estatisticamente significante entre os resultados. **Conclusão:** embora não tenha sido verificada correlação estatisticamente significante entre os resultados obtidos por meio dos dois instrumentos de avaliação, foi observada melhora no desempenho de reconhecimento de fala fazendo uso das próteses através do teste Listas de Sentenças em Português, tanto na avaliação no ruído, quanto no silêncio e, em resposta ao questionário, os avaliados referiram benefício com o uso da amplificação sonora.

DESCRITORES: Criança; Perda Auditiva; Auxiliares de Audição; Discriminação da fala; Questionários

Nome:
Idade:
Série:
Qual orelha usa AASI: ( ) OD ( ) OE ( ) Ambas
Uso do AASI:
( ) Somente em casa
( ) Somente na escola
( ) Somente na terapia de fono
( ) Em casa e na terapia
( ) Em casa e na escola
( ) Em todos os lugares que vou
Eu uso o AASI:
( ) somente pela manhã
( ) somente pela tarde
( ) somente pela noite
( ) por dois períodos ( )
( ) O dia todo. Só tiro para tomar banho e dormir

Parte A: Em casa

1)O AASI faz com que eu ouça melhor a televisão?

( ) Sim ☺ ( ) Não ☹ ( ) um pouco😐

2) Com o AASI ouço melhor o telefone ou campainha?

( ) Sim ☺ ( ) Não ☹ ( ) um pouco 😐

3) Com o AASI eu ouço meus pais me chamarem?

( ) Sim ☺ ( ) Não ☹ ( ) Um pouco😐

Parte B: Na escola

1) Com o AASI eu ouço o professor ?

( ) Sim ☺ ( ) Não ☹ ( ) Um pouco 😐

2) Com o AASI eu ouço meus amigos de classe?

( ) Sim ☺ ( ) Não ☹ ( ) Um pouco 😐

3) Com o AASI eu ouço o professor quando ele está perto?

( ) Sim ☺ ( ) Não ☹ ( ) Um pouco 😐

4) Com o AASI eu ouço o professor quando ele está longe?

( ) Sim ☺ ( ) Não ☹ ( ) Um pouco 😐

Parte C: Social

1) Com o AASI eu brinco melhor com meus amigos?

los.

( ) Sim ☺ ( ) Não ☹ ( ) Um pouco 😐

2) Com o AASI eu ouço meus amigos ?

( ) Sim ☺ ( ) Não ☹ ( ) Um pouco 😐

3) Com o AASi eu ouço os carros passando na rua ?

( ) Sim ☺ ( ) Não ☹ ( ) Um pouco 😐

4) Com o AASI eu ouço uma pessoa num lugar com barulho?

( ) Sim ☺ ( ) Não ☹ ( ) Um pouco 😐

Figure 1 – Questionnaire of Assessment of benefit of ISSA in Children and Youth People (Boscolo et al., 2006)

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