PEDIATRIC TEST OF SPEECH INTELLIGIBILITY WITH IPSILATERAL COMPETITIVE MESSAGE: NARRATIVE REVIEW ABOUT ITS APPLICABILITY

Teste de identificação de sentenças sintéticas com mensagem competitiva ipsilateral pediátrico: revisão narrativa sobre a sua aplicabilidade

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ABSTRACT

Auditory Processing is the capacity of the nervous system has to use the information that comes by hearing. The auditory skills are necessary so that there information processing. Behavioral tests are used to evaluate auditory processing disorders such as Pediatric Test of Speech Intelligibility with Ipsilateral Competitive Message (PSI/MCI), which assesses the ability of figure-ground for verbal sounds. It is about a narrative review that aims to identify the applicability of PSI test, in the last ten years. A search of the database: Lilacs, PubMed, Medline, IBCS and SciELO, was used as descriptors: auditory perception, hearing tests, auditory perceptual disorders, hearing, comprehension, combined with the word PSI. Have been found 52 items, being selected, read in their entirety and analyzed only eight articles. It was observed a large variability in their application, proving to be an important assessment tool in different populations and age groups.

KEYWORDS: Auditory Perception**;** Hearing Tests; Auditory Perceptual Disorders; Hearing; Comprehension

INTRODUCTION

Auditory processing is defined by perception at the central level of the sonorous stimuli picked up by the peripheral auditory system, with subjective responses, that is, the ability of the nervous system has to use the information that comes by hearing[1]. Diagnostic and therapeutic techniques have presented evolution enabling greater precision in identifying the Auditory Processing Disorder (APD).

The APD can be defined as a complex and heterogeneous group of changes in auditory processing, commonly associated with a number of hearing and learning difficulties, however, the peripheral hearing, may be within the normal ranges[2].

These skills are needed in order for information processing, among them: the detection of sound, location, attention, selective attention, figure-ground, binaural integration and separation, closure, recognition, discrimination, association, comprehension and memorization[3].

The evaluation of the auditory processing (AP) is used as a super-injunction subjective measure hearing ability that enables greater understanding of the communication function and it is useful in quantifying the hearing impairment resulting from functional deficits in the auditory system[4].

To evaluate the AP, international literature recommends the inclusion of auditory discrimination test, dichotic of binaural interaction, temporal auditory processing and low redundancy in monaural set of assessments of central auditory processing[5].

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These tests measure the ability to distinguish similar features in stimuli that differ in frequency, intensity and duration; the ability to integrate or separate the different auditory stimuli presented in each ear simultaneously; evaluating the binaural processes (Diotic) which depend on intensity difference of time and sound; the ability to analyze acoustic events as a function of time and the discrimination of modified speech stimuli by ear[5].

To assess the ability of figure-ground for verbal sounds, from the low redundancy tests, there is the Synthetic Sentence Identification Test with Ipsilateral Competitive Message (SSI) and its version for children, Synthetic Sentence Identification Test with Message competitive Ipsilateral Pediatric (PSI). The aim of these (tests) is to provide information about the physiological auditory mechanism of verbal sound recognition in dichotic listening monotic and, with the recommendation for adults and the elderly SSI (once it requires reading ability) and children PSI (with figures)[6].

This ability is the primary message ID in the presence of competitive sounds and the ability to realize it is very important in the execution of daily activities such as conversation in a noisy environment and the learning of a school subject, eg[6].

There is a need to understand the searches which have been realized through PSI test, since it is a pediatric testing and often have the need to use it in adults or older people with difficulty reading, for example. So, in this context, a narrative review of the publications being carried out with the PSI might be useful for the interpretation of the knowledge produced in the area. It could help the development of future research, especially in the aspect of adaptation of the test figures PSI, thinking in adults and the elderly.

Thus, the aim of this study was to perform a descriptive review of the PSI auditory processing test, identifying its applicability in the scientific community over the last ten years.

METHODS

It is descriptive review for data surveys on the application of PSI.

The sources which were used for this survey are national and international scientific literature published in the last 10 years (2004-2014). The sources were selected for research in electronic databases in the system of the Latin American Literature on Health Sciences (Lilacs), *National Center for Biotechnology Information, U.S. National Library of Medicine* (PubMed and Medline), *Information Behavior in Everyday Contexts* (IBECS) and *Scientific Eletronic Library Online* (SciELO). The descriptors used for the location of the articles were: auditory perception, hearing tests, disorder of auditory perception, hearing, understanding with their corresponding to the English language (*Auditory perception, Hearing Tests, auditory perceptual disorders, hearing e comprehension*), through structured vocabulary Health Sciences Descriptors (DeCS), prepared by the Virtual Health Library - Medicine®. In addition to descriptors, in all studies was added as a word, PSI stands for greater filtering.

In the first study (P1) descriptors were combined: hearing tests, hearing the word perception and PSI; the second survey (P2) were combined: disorder of auditory perception, hearing tests and PSI; the third survey (P3) was combined: auditory perception, auditory perception disorder and the word PSI. A fourth survey was conducted (P4) with descriptors: listening and understanding, along with the word PSI.

As selection criteria were used scientific articles published in the last ten years in Portuguese and / or English, indicating the use of PSI in its methodology. The selection resulted from the prior reading of titles and abstracts in databases, which showed research conducted with PSI Test.

The initial search found 52 articles, of which eight were selected. 44 articles were excluded, 31 of them because they are duplicated in two or more databases, nine for not having the full text available and 4 in which the researchers did not use the PSI test methodology were excluded.

The eight articles that met the selection criteria were analyzed and read in full.

Table 1 shows the search strategies used for literature.

Table 1 – Descriptors used to search the databases in this study

	Keywords in Portuguese	Keywords in English
First survey (FS)(P1)	Percepção auditiva e Testes auditivos	Auditory perception and Hearing Tests
Second survey(P2)	Testes auditivos e Transtornos da percepção auditiva	Hearing Tests Auditory perceptual disorders
Third survey(P3)	Percepção auditiva e Transtornos da percepção auditiva	Auditory perception and Auditory perceptual disorders
Fourth search / survey(P4)	Audição e compreensão	Hearing and comprehension

LITERATURE REVIEW

Figure 1 depicts the results of the search in databases, cataloging the titles with their authors, journal and year.

Analysis of selected studies

Few studies in the compiled literature used the PSI test in the last ten years, which would fit the criteria of this review with a visa period, descriptors and searchable databases. However, the analysis thereof indicates an application of variability in different samples. The articles analyzed showed similarity in relation to their goals, methods and findings, but in different populations.

Among the studies found, the PSI was one of the tests used for verifying the maturation of auditory processing in students with ages eight, nine and ten, with and without learning difficulties in order to check the response improves with increasing age in auditory processing skills. The response of improvement in both groups was observed, noting that the children group with learning difficulties presented a lower performance in all the tests applied to the three age groups, suggesting delayed maturation of auditory processing skills[7].

In another study, we compared 30 children aged between four and seven years old, born preterm and full-term, pointed up delay on some auditory processing, noting it worse performance in preterm children than children born at term[8].

Other authors, who studied the relationship between auditory processing and the acquisition of normal and disordered speech in 44 children between five and seven years, found that children with speech deviant had lower results than those with normal speech in all tests, including the PSI, concluding that the auditory processing can interfere in speech development[9].

The relationship between auditory skills and combinations of traits present in the speech of children with phonological disorders was a research subject in a population of 22 children diagnosed with phonological disorder, aged 5 and 7 years and both genders. The authors observed that all children had 100% success in the PSI, but in other tests used showed changes in temporal organization skills and figure-ground as well, lagged sensory memory, pointing out that such alterations can compromise the acquisition of these traits described[10].

The importance of auditory processing issues related to the speech of children and the PSI test was demonstrated in two studies described above, indicating such a test as an important assessment tool.

The PSI was also used to verify the performance of 27 children from seven to 11 years with isolated cleft palate in auditory processing tests. As regards the PSI / SSI with ipsilateral competitive message, both the average values and the minimum values, they showed bilaterally well below that expected for all signal-to-noise ratios evaluated, showing difficulty in performing this task monotic through of selective attention. However, when the test was carried out with dichotic task the children performed better than monotic[11].

Another survey, covering patients with unilateral congenital aural atresia evaluated the possible benefit of binaural hearing in two distinct periods: before and one month after repair surgery. In this article was used the test - *Hearing in Noise Test* - HINT or its version for children HINTC-C to assess speech recognition with and without competitive noise, comparing such results with PSI assessment performed in a previous study population with the same characteristics[12].

In another study, the authors evaluated 20 aphasic subjects with mild comprehension disorder, in order to verify the performance figure-ground tasks and selective attention to verbal sounds in competing message listener. The subjects had difficulties in understanding, statistically significant, in situations of ipsilateral competitive message, the 0 dB and -10 dB situations and also in contralateral

Title	Author	Journal	Year
1. O processamento auditivo e a combinação de traços distintivos na aquisição de fala em crianças com desvios fonológicos. Auditory processing and combination of distinctive features in speech acquisition in children with phonological disorders	Quintas VG, Attoni TM, Keske-Soares M, Mezzomo CL.	Rev Soc Bras Fonoaudiol	2011
2. Avaliação do processamento auditivo em crianças nascidas pré-termo.	Gallo J, Dias K.Z, Pereira L.D, Azevedo M, Sousa EC.	J Soc Bras Fonoaudiol	2011
3. Auditory processing in children with normal and disordered speech. Processamento auditivo em crianças com fala normal e desviante.	Quintas VG, Attoni, TM, Keske-Soares M, Mezzomo C L.	Braz. j. otorhinolaryngol	2010
4. Understanding speech in noise after correction of congenital unilateral aural atresia: effects of age the emergence of binaural squelch but not in use of head-shadow.	Lincoln G, Bradley K, Erika C.	Braz J Otorhinolaryngol.	2009
5.Crianças com fissura isolada de palato: desempenho nos testes de processamento auditivo.	*Boscariol* M,*André* K D,Feniman M R.	Int J Pediatr Otorhinolaryngol.	2009
6. Compreensão de fala em situação de mensagem competitiva em afásicos.	Ortiz KZ, Peroni CV.	Rev. CEFAC	2008
7. Maturação do processamento auditivo em crianças com e sem dificuldades escolares	Neves IF, Schochat E.	Pró-Fono R. Atual. Cient	2005
8. Processamento auditivo em idosos: estudo da interação por meio de testes com estímulo verbais e não-verbais	Pinheiro MMC, Pereira L D.	Braz J Otorhinolaryngol	2004

Figure 1 – Included papers references in Literature Review

competitive messages in the relation- 40 dB evident difficulties in understanding verbal stimuli in such tasks[13].

The PSI was applied to 110 elderly subjects, aged 60 to 85 years, in order to characterize the aspect of the interaction of verbal and non-verbal in elderly patients with and without hearing loss. The authors observed that the test of sound localization and the PSI showed a significant dependence on the degree of hearing loss. These results might contribute in order to elucidate how the brain injury, the effects of age and consequently the loss of auditory perceptual skills can interfere with understanding information in day-to-day, where various messages that occur competitively[14].

The last two studies mentioned above, relatively recent, demonstrate the possibility of applying the PSI in adults. Despite being a test developed for children, the PSI may be used in adults with language disorders, elderly and illiterate with visual difficulties to be unfit to perform the SSI. So, the need for adaptation of this evaluation tool for an adult version may be a new facet that must be considered for future research.

This literature review aims to contribute to the scientific community, which studies specifically auditory processing emphasizing the concern for

the best choice of the tests to be applied in different subjects.

In most of the literature studies the PSI test was applied in its population, originally children, but was also applied in aphasic adults and seniors.

It could be seen with this study the possibility of holding a descriptive review with the PSI test and observe its application in a population of variability, addressing different aspects such as the evaluation of the PA maturation and speech development processes and their traits in children, as well as language disorders in adults and elderly, as they have changes that hinder the performance of other tests for such evaluation (SSI). The PSI has proven to be an important evaluation tool auditory processing in different populations and age groups because their results were altered in children with learning difficulties in premature infants, in children with deviant talks with cleft palate in aphasic and elderly.

We conclude that in the past decade few studies have been performed with the PSI and a descriptive review lies researchers on research that should be conducted. For adult and elderly population, with inability to perform SSI, an adaptation in the PSI figures can contribute to higher test applicability in identifying the skill of background figure for verbal sounds.

CONCLUSION

We conclude that in the past decade few studies have been performed with the PSI and a descriptive review lies researchers on research that should be conducted. For adult and elderly population, with inability to perform SSI, an adaptation in the PSI figures can contribute to higher test applicability in identifying the skill of background figure for verbal sounds.

RESUMO

O Processamento auditivo é a capacidade que o sistema nervoso tem para usar a informação que chega pela audição. As habilidades auditivas são necessárias para que haja o processamento das informações. Testes comportamentais são utilizados para avaliar desordens do processamento auditivo, como o Teste de Identificação de Sentenças Sintéticas com Mensagem Competitiva Ipsilateral Pediátrico (PSI), que avalia a habilidade de figura-fundo para sons verbais. Trata-se de uma revisão narrativa que objetiva identificar a aplicabilidade do teste PSI, nos últimos dez anos. Uma busca nas bases de dados: *Lilacs, PubMed, Medline, IBCS* e *SciELO* foi realizada, utilizando-se como descritores: percepção auditiva, testes auditivos, transtorno da percepção auditiva ,audição, compreensão, combinados com a palavra PSI. Foram encontrados 52 artigos, sendo selecionados, lidos na íntegra e analisados, apenas, oito artigos. Pôde-se observar grande variabilidade em sua aplicação, demonstrando ser uma eficaz ferramenta de avaliação do processamento auditivo em diferentes populações e faixas etárias.

DESCRITORES: Percepção Auditiva; Testes Auditivos; Transtornos da Percepção Auditiva; Audição; Compreensão

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