Sustained auditory attention ability in children with cleft lip and palate and phonological disorders

A habilidade de atenção auditiva sustentada em crianças com fissura labiopalatina e transtorno fonológico

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ABSTRACT

Purpose: To verify the ability of sustained auditory attention in children with cleft lip and palate and phonological disorder, in comparison with the performance of children with cleft lip and palate and absence of phonological disorder. **Methods:** Seventeen children with ages between 6 and 11 years, with repaired unilateral complete cleft lip and palate and absence of auditory complaints or hearing problems, were divided into two groups: GI (with phonological disorder) and GII (absence of phonological disorder). Audiometry and tympanometry were carried out to detect hearing problems. To diagnose phonological disorder, the following instruments were used: Child Language Test, and Phonological Awareness: Instrument of Sequential Assessment. The ability of auditory attention was assessed using the Test of Sustained Auditory Attention Ability. **Results:** From seven children with phonological disorder (41%), two (29%) had altered results in the Test of Sustained Auditory Attention Ability. There was no difference between children with cleft lip and palate and phonological disorder and children with cleft lip and palate and absence of phonological disorder regarding the results of the Test of Sustained Auditory Attention Ability. **Conclusion:** The sustained auditory attention ability in children with cleft lip and palate and phonological disorder do not differ from the sustained auditory attention ability of children with cleft lip and palate without phonological disorder.

Keywords: Auditory perception; Attention; Hearing; Child; Cleft palate; Communication; Speech disorders

INTRODUCTION

Auditory attention is an important process for the acquisition of acoustic and phonetic language aspects. Attention refers to the determination of which sound stimulus will be processed and which will be given an answer. Part of auditory attention, the sustained auditory attention is defined as the listener's ability to maintain a specific stimulus during a period of time, and vigilance is the ability to remain prepared for a response to a flashing stimulus[1,2].

A phonological disorder is defined as a difficulty in the phonological level of linguistic organization and lack of mechanical articulatory production and may involve errors in perception or in the sound's organization[3], being related to using abnormal patterns in speech.

Without etiology established by the scientific literature, phonological disorder is the most frequent communication difficulties diagnosis in preschool children, affecting about 10% of this population[4-6], prevailing in males[7].

Studies have shown that children with otitis media with effusion (OME) usually have a conductive hearing loss from mild to moderate[8], which is considered a risk indicator for changes in the acquisition of the phonological system[9,10]. In addition to the phonological system changes, hearing loss caused by OME can change the child's auditory attention[11].

The development of the phonological system occurs similarly in children with cleft lip and palate (CLP) and in children without this malformation. However, in children with CLP, a delay occurs in this development, which can cause a phonological disorder[12].

Cleft lip and palate is the result of a congenital malformation caused by failures in development or maturation of the embryonic processes. The etiology is multifactorial, including environmental and genetic factors. The OME occurrence in children with CLP is relevant, at a rate of around 50% to 93%. The OME occurs because the soft palate tensor muscle

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operation is compromised and the Eustachian tube compliance is increased[13,14].

Most of the children with CLP have changes in the middle ear[14-17]. These changes result in sensory deprivation, which is considered a risk indicator for development of auditory processing, language, speech, learning, and cognitive potential.

As the phonological disorder is quite common and can cause much damage in children's development, so the audiologists has increased its activities in language disorders prevention and rehabilitation.

Thus, this study aims to check the sustained auditory attention ability in children with CLP and phonological disorders, and compare it with performance of children with CLP and without phonological disorder.

METHODS

This study was approved by the Ethics Committee (protocol no. 154/2007, Bauru School of Dentistry, Universidade de São Paulo – USP). The parents were informed about the objectives and procedures, and signed an informed consent. Only after this procedure were the assessments initiated.

Forty children with CLP were invited to participate in this study, randomly chosen from a hospital that specializes in this type of craniofacial malformation; they were of both genders, ranging from 6 to 11 years old. This age group was prioritized because of the test parameters applied. The inclusion criteria for the participants in this study were: unilateral cleft lip and palate repaired, without associated syndromes and global change in development and with no complaint or hearing problem (verified by audiometry results within normal limits — thresholds ≤15 dB — and tympanometry curve type A in both ears).

To diagnose phonological disorders the following instruments were used: Child Language Test: Phonology — ABFW[4] and Phonological Awareness: Instrument of Sequential Assessment — CONFIAS[18].

The Child Language Test — ABFW[4] evaluates phonology, vocabulary, fluency, and pragmatics. Its average application time varies according to age and the specific characteristics of each child and each speech pathologist. In this study only the phonological subtest was applied.

The phonology subtest consists in evaluating the phonetic inventory and 14 phonological processes analyzed qualitatively and quantitatively: syllable reduction, consonantal harmony, stopping, velar posteriorization, palatine posteriorization, velar fronting, palatine fronting, liquid simplification, cluster reduction, final consonant deletion, voicing of plosive, voicing of fricatives, devoicing of plosive, devoicing of fricative.

CONFIAS was proposed by Moojen et al.[18] and features 16 phonological tasks, divided into syllables and phoneme level: synthesis, segmentation, identification of the initial syllable, rhyme identification, production of word with the syllable given, identification of syllable medial, production of rhyme, deletion, transposition, production of a word that starts with a specific sound, and identification of initial and final phoneme. Each task is preceded by two initial examples, the evaluator explains to the child what should be done and, when necessary, the answers are corrected.

The results were analyzed according to the directions of the authors, which indicate the use of a protocol where the correct answer counts as one point and incorrect answers count as none.

From the 40 children invited, 23 were excluded based on the inclusion criteria. Seventeen children were within the established criteria and, based in phonological evaluation, seven (41%) had speech disorders. Thus, two groups were formed, GI and GII:

- Group GI: seven children with CLP and phonological disorders;
- Group GII: ten children with CLP and without phonological disorders.

In GI, six children (86%) were male and one (14%) was female. In GII, eight (80%) were male and two (20%) were female.

Both groups were submitted to the Sustained Auditory Attention Ability Test (SAAAT) proposed by Feniman[19]. This test aims to assess the child's ability to hear auditory stimuli during an extended period of time and respond only to specific stimuli. It also evaluates the auditory vigilance (correct responses to specific linguistic clues) and sustained attention (ability to focus attention and concentration on the task for an extended period of time). The test consists of a dihotic presentation of 100 monosyllabic words, presented six times at the rate of one word per second, recorded on compact disc (CD). The child should be informed that he will hear several words and must raise his hand every time that he notes the word "no."

The test is performed in a soundproof booth, with a CD player (D-171, Sony®) coupled to a two-channel audiometer (Midimate 622, Madsen Electronics®) with an intensity of 50 dBSL, taking the average of air thresholds hearing for each ear, presented as dihotic binaural listening.

In SAAAT performance is considered the total score of errors and the vigilance decrement. Two types of responses are considered error: inattention — when the child does not raise his hand in response to the target word ("no") before the next word; and impulsivity — when the child holds up his hand to another word instead of the word "no."

Vigilance decrement is the difference between the number of correct responses on first presentation and the number of correct answers in the sixth presentation.

The average time to complete all assessments proposed was one hour for each child, and SAAAT is the first test applied.

The results were organized in a database and graphs and tables have been made for analysis. The statistical analysis followed the criteria of the procedures for each instrument.

To compare the categories statistical analysis was performed using the Mann-Whitney test to compare the performance of GI and GII in each type of response in SAAAT (total error, inattention error, impulsivity, vigilance decrement), and Fisher's exact test to analyze the relationship between SAAAT and phonological disorders, with a significance level of p=0.05.

RESULTS

Describing the SAAAT results, researchers noted that both groups had similar behavior, with higher average scores on

Table 1. SAAAT results in children evaluated

	Mean		SD		Median		Minimum		Maximum	
	GI	GII	GI	GII	GI	GII	GI	GII	GI	GII
Total errors	23.42	30.8	11.51	14.25	21	25.5	8	19	39	67
Inattention	16	20.4	6.42	5.93	17	20	4	11	25	32
Impulsivity	7.28	10.4	6.62	10	4	9	0	2	17	35
Vigilance decrement	2.85	4.4	3.23	3.34	2	3	0	1	9	12

Note: SD = standard deviation

Table 2. SAAAT results in children with phonological disorders

Age	Inattention	Impulsivity	Total errors	Vigilance decrement
8 years and 5 months	17	3	17	0
7 years and 10 months	17	4	21	3
7 years and 3 months	20	7	27	2
7 years	15	0	15	5
9 years and 6 months	4	4	8	0
7 years and 10 months*	19	18	37	1
9 years and 1 month*	25	14	39	9

*Abnormal results

the variables total errors and inattention error, followed by impulsivity. Vigilance decrement was the lowest score.

The SAAAT results showed altered in two children (29%) of the GI (Table 2).

The results were statistically analyzed by comparing the groups of children with phonological disorders (GI) and without phonological disorder (GII), using the Mann-Whitney test (Table 3). In this test there was no difference between groups with regard to the results of the SAAAT.

Table 3. Comparison between SAAAT results in GI and GII

SAAAT	p-value
Total errors	0.23
Inattention	0.19
Impulsivity	0.81
Vigilance decrement	0.23

Mann-Whitney test (p≤0.05)

For the analysis of the qualitative variables we used the Fisher exact test, which showed no difference between the variables (Table 4).

Table 4. Comparison between SAAAT performance in GI and GII

Group	Good performance (%)	Abnormal performance (%)
GI	71.43	28.57
GII	50.00	50.00
Total	58.82	41.18
p-value	0.622	

Fisher Exact test (p≤0.05)

DISCUSSION

In this study children with complaints and/or hearing loss were excluded because it could compromise the results of the SAAAT. The literature reports that the presence of these changes may influence the test results[20].

The high rate of children (n=23) who were excluded from the study due to hearing complaints or changes in the audiometric testing can be justified by the high incidence of otitis media in children with CLP[21] which happens by the malfunction of the tensor muscle soft palate[14,15].

Literature[4-6,22] reports that the prevalence of phonological disorders in children without craniofacial anomalies is about 8% to 10%. Thus, although the prevalence of these changes was not found in children with CLP, a higher delay has been demonstrated in the phonology development in children with CLP[12].

The low number of children with speech disorders can be attributed to presence of articulatory compensations, which were not considered in this study as a phonological disorder.

The dates that the primary palate surgery occurred were not studied, but the sooner the surgery is done, the better is the child's speech development, approaching the speech development of a child without CLP[23].

Data from the literature[24] indicate that the performance of children with CLP in the SAAAT was lower than the performance of children without this craniofacial malformation.

In this study, the sustained auditory attention was abnormal in 29% of children with CLP and phonological disorders. In children with CLP and without a phonological disorder, this ability was abnormal in 50%. According to the literature[25,26] in the presence of alterations in auditory attention, the child's risk of developing speech disorders is higher. This is because the attention process works together with the capacity to deal with sounds received through hearing development. However, this study found a predominantly change in sustained auditory attention in children without a phonological disorder, although this was not statistically significant in the sample studied.

A justification for these data is that the number of children with phonological disorders was smaller than the number of children without phonological disorder (seven and ten, respectively). Another relevant factor is the presence of middle ear alterations: Children with CLP have long periods of sensory deprivation caused by the high incidence of otitis media, resulting in changes in the auditory and speech development skills[9,10,12,15-17,26,27]. The children evaluated had no hearing impairment on the day of the phonological assessment; however, the sensorial auditory deprivation may have affected the two groups because both have CLP, justifying the alteration found, but not the difference between the groups.

Comparing the mean of inattention error and impulsivity in the group of children with CLP and phonological disorders, it is possible to observe more inattention errors, being 2.19 times higher than the impulsivity errors, which is confirmed by literature review[19].

In this study, the mean vigilance decrement of children with CLP and phonological disorders is 2.85. In children with normal hearing, researchers found a vigilance decrement of 1.5 in SAAAT[19]. It can be concluded that the results found here characterize a deficit in sustained attention.

Studies aiming to evaluate and understand the changes in auditory attention in patients with this type of malformation are few. Similar research should be developed from the work described here to extend existing knowledge in this area, contributing to increased understanding of the changes and difficulties presented by patients.

CONCLUSION

The sustained auditory attention ability in children with CLP and with phonological disorders does not differ from that of the children with CLP and without phonological disorders. These two groups showed change in this ability, but no differences between them.

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RESUMO

Objetivo: Verificar a habilidade de atenção auditiva sustentada em crianças com fissura labiopalatina e transtorno fonológico, comparando o desempenho com crianças com fissura labiopalatina e ausência de transtorno fonológico. **Métodos:** Dezessete crianças com idade entre 6 e 11 anos, com fissura labiopalatina transforame unilateral operada e ausência de queixa e/ou alteração auditiva, separadas em dois grupos: GI (com transtorno fonológico) e GII (com ausência de transtorno fonológico). Para detecção de alteração auditiva foram realizadas audiometria e timpanometria. Para avaliação fonológica foram utilizados os seguintes instrumentos: Teste de Linguagem Infantil e Consciência Fonológica: Instrumento de Avaliação Sequencial. Para avaliar a habilidade de atenção auditiva foi aplicado o Teste da Habilidade de Atenção Auditiva Sustentada. **Resultados:** Das sete crianças com transtorno fonológico (41%), duas (29%) apresentaram alteração nos resultados do Teste da Habilidade de Atenção Auditiva Sustentada. Não houve diferença entre as crianças com fissura labiopalatina e transtorno fonológico e as crianças com fissura labiopalatina e ausência de transtorno fonológico quanto aos resultados do Teste de Habilidade de Atenção Auditiva Sustentada. **Conclusão:** A habilidade de atenção auditiva sustentada nas crianças com fissura labiopalatina e transtorno fonológico não difere da habilidade de atenção auditiva sustentada de crianças com fissura labiopalatina sem transtorno fonológico.

Descritores: Percepção auditiva; Atenção; Audição; Criança; Fissura palatina; Comunicação; Distúrbios da fala

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