Original Article

Children showing labial palatine fissures and a low weight at birth in central hearing tests

Crianças com fissura labiopalatina e baixo peso ao nascimento em testes auditivos centrais

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SUMMARY

Introduction: Neurological or sensorial alterations, some of which are peripheral and/or central hearing alterations, are focused on both the people showing a low weight at birth (LW) and the presence of craniofacial malformation, such as labial palatine fissure (LPF).
Objective: Check and compare the results of hearing processing tests, Dichotic Listening Test (DLT) and Auditory Fusion Test-Revised (AFT-R) in LPF and LW children with those in children born with a normal weight and showing no LPF.
Methods: Retrospective comparative study with 73 records, in which sex, weight at birth, LPF presence/absence and the DLT and AFT-R results were verified. Three groups were formed based on the analysis of weight at birth and FLP absence/presence.
Results: For DLT, the Covariance Analysis did not present any difference between the groups and sexes; however the age covariant showed a statistically significant relation. Fort AFT-R, there was no difference between groups, sexes and ages.
Conclusion: LPF AND LW children, however statistically insignificant, showed bigger modifications in the hearing processing tests in comparison with isolated LPF children and with children having neither this craniofacial malformation nor LW. It must as well be emphasized that an increase in age enhanced DDT performance.
Keywords: auditory recognition; palatine fissure; hearing tests

RESUMO

Introdução: Alterações neurológicas ou sensoriais, entre elas as alterações auditivas periféricas e/ou centrais, são enfatizadas na população com baixo peso ao nascimento (BP), assim como, na presença de malformação craniofacial, tal como a fissura labiopalatina (FLP).
Objetivo: Verificar e comparar o resultado de testes de processamento auditivo, Teste Dicótico de Dígitos (TDD) e Teste de Fusão Auditiva-Revisado (AFT-R), de crianças com FLP com e BP ao nascimento, com o de crianças sem FLP e nascida com peso normal.
Método: Estudo retrospectivo e comparativo de 73 prontuários, dos quais foram verificados o sexo, peso ao nascimento, presença/ausência de FLP e o resultado de TDD e AFT-R. Foram constituídos três grupos de acordo com a análise do peso ao nascimento e presença ou ausência de FLP.
Resultados: Para o TDD a Análise de Covariância não mostrou diferença entre os grupos e sexos, porém a co-variável idade mostrou relação estatisticamente significante.Para o AFT-R não mostrou diferença entre os grupos, sexos e idades.
Conclusão: Crianças com FLP e BP, embora sem significância estatística, apresentam maiores alterações nos testes de processamento auditivo utilizados ao comparar com crianças com FLP isolada e com crianças sem esta malformação craniofacial e sem BP.Ressalta-se ainda que o aumento da idade melhorou o desempenho no TDD.
Palavras-chave: percepção auditiva, fissura palatina testes auditivos.

INTRODUCTION

Neurological or sensorial alterations, such as peripheral and/or central auditory alterations, are emphasized on the population having a low weight at birth (1-5), as well as the presence of craniofacial malformation, such as labial palatine fissure (6-12).

The hearing processing disorder is a central auditory alteration referring to the difficulties in processing the auditory information on the central nervous system, demonstrated by a poor performance in the auditory abilities and processes, some of which are binaural integration, background figure and temporal resolution (13).

The standard test of binaural integration is the dichotic hearing test, in which the listener is requested to repeat all the information shown in both ears (14, 15). The use of digits in the dichotic hearing test minimizes the imposed linguistic load (16).

The Auditory Fusion Test-Revised (AFT-R) is used to evaluate the ability of temporal resolution of the hearing process. Temporal resolution, especially in the pediatric population, is a critical hearing ability required for an effective hearing process. It is defined as the ability of the auditory system to respond to the rapid changes of a sound stimulus (17).

Such tests are proposed as a behavior screening of hearing process (16) and described and recommended as present at a minimum series of hearing process tests (13, 16).

Considering that individuals with labial palatine fissure show a higher likelihood of having a low weight (18) and that it indicates an extreme association with the central auditory development, it has been considered necessary to perform a retrospective comparative study of the results in the central hearing tests in children having this craniofacial malformation and born with a low weight at birth, with a view to helping characterize their audiological profile and verifying whether a full evaluation of the hearing process is necessary.

The objective of this study was to verify and compare the result of hearing process tests (DLT and AFT-R) in children showing labial palatine fissure with or without a low weight at birth with that of children without this craniofacial malformation and born at a normal weight.

METHOD

After approved by the Ethical Committee of Research in Human Beings (Process Nº 095/2009), a retrospective and comparative study was performed by analyzing 73 records of children submitted to the hearing process screening in the period between July 2004 and June 2007 at a hospital in the countryside of the Brazilian State of São Paulo when working with cranial malformations. This research was performed in the year 2009.

Have labial palatine fissure or not; have a diagnosis of normal peripheral hearing, age between 7 and 12 at the time of the hearing process screening; male or female; and have signed the Free and Clarified Agreement Term - these were the criteria in this study. Children who had neither their labial palatine fissure operated nor any other malformation, with a diagnosed hearing loss, were excluded.

In the records, data was verified with regard to sex, weight at birth, presence/absence of labial palatine fissure and the result of the two hearing process tests, the Dichotic Listening Test (DLT) and the Auditory Fusion Test-Revised (AFT-R) used to screen the hearing process.

Based on the data collected, three groups were formed:

- G1: 23 children having labial palatine fissure and low weight at birth;
- G2: 25 children having labial palatine fissure and normal weight at birth;
- G3: 25 crianças sem labial palatine fissure e normal weight at birth.

Table 1 shows a distribution of children regarding age and sex in the three sample groups.

Weights at birth met the following criteria: low weight(1500-2500g); normal weight (2500-4000g) and macrosomia (above de 4000g) (19).

In the hearing processing tests performed (Auditory Fusion Test AFT-R (20) and Dichotic Listening Test (21), a CD player-coupled SD50 two-channel clinical audiometer was used at 50 dBNS.

At *Auditory Fusion Test-Revised* (AFT-R), pure tones were shown with an intensity of 50 dBNS at the frequencies of 250, 500, 1000, 2000 and 4000 Hz, having a short time interval between the tone pairs. The child should say if he/she heard one or two tones. For 7-year-old children, a 9ms-fusion threshold is expected; whereas for 8-year-old children, the expected fusion threshold is 8ms (10).

At Dichotic Listening Test (DLT), the version recorded in the Binaural Integration stage was recorded and consisted in presenting 40 pairs of different disyllable

Table 1. Distribution of children regarding Group, Age and Sex.

Group	Age (years)												
	7		8		9		10		11		12		Total
	M	F	M	F	M	F	M	F	M	F	M	F	
G1	0	2	2	1	5	0	7	1	0	2	3	0	23
G2	1	3	3	3	2	3	0	5	3	0	2	0	25
G3	4	3	1	1	2	2	5	2	2	0	0	3	25
Total	5	8	6	5	9	5	12	8	5	2	5	3	73

Legend: G1 = 23 children having labial palatine fissure and low weight at birth; G2 = 25 children having labial palatine fissure and normal weight at birth; G3 = 25 children without labial palatine fissure and normal weight at birth; M = male; F = female.

Table 2. Average values and standard deviations of the Dichotic Listening Test in the different groups (G1, G2, G3), according to age.

Age	G1		G2		G3	
(years)	Average	sd	Average	sd	Average	sd
7	84.7	6.2	70.5	16.0	88.1	9.3
8	85.2	6.9	88.6	5.8	89.6	13.3
9	86.0	20.7	92.3	4.4	97.8	2.6
10	90.8	9.2	94.3	5.5	96.4	2.5
11	94.7	5.7	96.7	3.4	99.1	1.9
12	92.3	9.3	97.2	1.6	98.1	1.7
Total	89.0	12.0	89.2	11.5	94.2	7.5

Legend: G1 = 23 children having labial palatine fissure and low weight at birth; G2 = 25 children having labial palatine fissure and normal weight at birth; G3 = 25 children without labial palatine fissure and normal weight at birth; sd = standard deviation.

digits in two pairs of numbers in both ears simultaneously. The child should repeat the four numbers he/she heard.

In this study, DLT was considered changed when the result of either ear (right or left) showed a score lower than expected. For 7 and 8-year-old children, a percentage equal to or higher than 85% of right answers is expected in the right ear and a percentage equal to or higher than 82% is expected n the left ear; for 9-12-year-old children, scores equal to or higher than 95% are expected (10).

Based on the aforementioned information, a comparative analysis was performed for each group (sex and age) and between the group. Nevertheless, not all the population performed both tests described in the methodology, due to test requirements and difficulties shown by the child.

The data obtained was grouped into Tables to make analyses easier, comparison and presentation, according to the proposed objectives. The Dichotic Listening data passed through Kolmogorov-Smirnov's test to make a comparison between Groups, Sexes and Ages were perform Covariance Analysis by using a variant such as Age Covariant. AFT-R data did not pass by Kolmogorov-Smirno's normality criteria; hence Kruskal-Wallis non-parametric test was used to make a comparison between Groups. In all statistic tests, a significance level of 5% was adopted (p<0,05).

Results

For Dichotic Listening Test (Table 2), Covariance Analysis show there is a statistically significant difference neither between the groups (p=06.340), between the sexes (p=0.985) nor for an interaction between these factors (p=0,112); however, covariant Age showed a statistically significant association with Dichotic Listening (p<0.001). The correlation coefficient of age with Dichotic Listening was r=0.48.

Table 3. Average values and standard deviations of the AFT-R in the different groups (G1, G2, G3), according to age.

Idade	G1		G2		G3	
(years)	Average	sd	Average	sd	Average	sd
7	9,4	0,0	100,4	24,2	45,1	60,8
8	84,4	65,1	59,4	48,6	11,9	9,1
9	27,9	44,8	115,0	0,0	5,4	1,9
10	50,6	52,5	29,9	46,2	6,4	9,2
11	53,6	63,2	37,2	46,5	3,4	0,2
12	49,4	66,8	5,5	0,0	8,6	5,6
Total	49,1	50,8	55,3	47,2	15,2	29,3

Legend: G1 = 23 children having labial palatine fissure and low weight at birth; G2 = 25 children having labial palatine fissure and normal weight at birth; G3 = 25 children without labial palatine fissure and normal weight at birth; sd = standard deviation.

For AFT-R (Table 3), Kruskal- Wallis showed a statistically significant difference neither between the groups (p=0.136), between the sexrs (p=0.371) nor between ages (p=0.378).

Discussion

The scores changed in both AFT-R and Dichotic Listening Test shown by labial palatine fissure children born at low weight (Table 2 and Table 3) suggests a weak temporal resolution ability, as well as a difficulty in the binaural integration and background figure for verbal sounds. This result makes us consider that such children can show a difficulty in rapidly distinguishing and identifying sound introduced in the speech; additionally, a poor performance in the binaural integration and background figure can be expressed in the behavioral symptoms of difficulties in either a back noise or listening to two simultaneous conversations (14,15, 22).

The alterations found in the tests suggested by this study can still be justified by the reduced ability to remember the auditory information (10, 14), such an ability is required in AFT-R and Dichotic Listening tests.

A study (11) intends to check labial palatine fissure children in the Dichotic Listening Test and compare them with a group without labial palatine fissure reports the difference in boys' and girls' performance, in which the girls show lower ratios of right answers than those in the studied control group, in opposition to the present work, which showed no significance between the sexes. Consideration must be taken because the studied stage by the authors (11) was focused on a stage of binaural separation-requiring directed listening, in which the listener pays attention to a sound introduced into an ear, while ignoring the other sound simultaneously introduced into the other ear. This has been referred to as directed auditory attention (23). In contrast, in the present study, the binaural integration has been requested, in which the listener must repeat all the information simultaneously introduced into both ears (14, 15), sometimes referred to as shared auditory attention (23). It is emphasized that different dichotic tasks reveal different results (11).

Researchers (10) demonstrated a high percentage of children with labial palatine fissure and their worst performances in AFT-R (95%) and DLT (95%) tests.

Alteration in AFT-R shown by the population with labial palatine fissure was also verified by other researchers (9), who studied the average thresholds of auditory fusion in children aged between 6 and 7 with and without labial palatine fissure, demonstrating that in children having this craniofacial malformation, the auditory fusion thresholds were significantly higher in comparison with the group without labial palatine fissure, therefore they were regarded as an indication of temporal auditory processing. The authors assigned that to the sensorial privacy derived from the otitis media shown in the first years of life. This work did not emphasize the history study of otitis media in the studied population.

Researchers (24) indicate an improvement in temporal resolution tasks with age, the present study did not find a statistically significant difference between the evaluated ages. A similar result was achieved in a research (17) with children aged between 7 and 18 by using GIN (*Gaps-In-Noise*) (25) temporal resolution test.

The significance of age variant in the Dichotic Listening Test regarded as evident in this study confirms the literature by stating that the improvement of the auditory abilities with age, especially between eight and ten, is associated with the maturation process (26). The relevance of the maturation of the child's auditory system must be emphasized. The hearing processing tests depend on the neural function, therefore, the results must be analyzed with an emphasis on neuromaturation (15, 23).

Conclusion

The results of the present work show that children having labial palatine fissure and low weight at birth, however statistically insignificant, show bigger alterations in the hearing processing tests used to compare with children having an isolated labial palatine fissure and with children having neither this malformation nor low weight at birth. It is still emphasized that the increase in age improved the performed in the Dichotic Listening Test.

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