O aspecto familial e o transtorno fonológico***

Familial aspect and phonological disorder

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Abstract
Background: phonological disorder. Aim: to verify the phonological processes used by phonologically disordered children with and without family history of speech and language disorders; the association between the phonological processes; the difference between the Percentage of Correct Consonants-Revised (PCC-R) severity index regarding family history. Method: participants were 104 subjects - 25 phonologically disordered children - with no history of previous speech-language therapy, living with their biological parents and siblings. The material used was a child development questionnaire and the phonology tests of the *Teste de Linguagem Infantil - ABFW*. Results: liquid simplification was the most observed process independently of family history; the phonological process of devoicing was mostly observed when the family members presented phonological disorders; the phonological process observed in children are, in general, different from those presented by the family nucleus, and those that are similar do not determine characteristics of family history since they are processes frequently observed in subjects with phonological disorders; the PCC-R severity index did not differentiate types of phonological disorders regarding family history. Conclusion: this research shows characteristics that indicate that family history of speech and language disorder is associated to phonological disorders. The knowledge about the child's family history facilitates the planning and execution of early intervention actions, preventing the aggravation of phonological disorders. The PCC-R severity index does not differentiate types of phonological disorders regarding family history.
Key Words: Articulation Disorders; Speech Articulation Tests; Severity of Illness Index.

Resumo
Tema: transtorno fonológico. Objetivo: verificar: os processos fonológicos apresentados por crianças com diagnóstico de transtorno fonológico com e sem história de transtorno de fala e linguagem no núcleo familiar; a associação entre os processos fonológicos; a diferença do índice de gravidade Porcentagem de Consoantes Corretas-Revisado (PCC-R) em relação ao histórico familial. Método: participaram da pesquisa 104 sujeitos - sendo 25 crianças com transtorno fonológico, sem terapia fonoaudiológica prévia e deveriam morar com os pais biológicos e seus irmãos. O material utilizado foi anamnese, questionário específico e as provas de fonologia do Teste de Linguagem Infantil ABFW. Resultados: a simplificação de líquidas foi o processo fonológico mais ocorrente independentemente do histórico familial; os processos fonológicos de ensurdecimento foram mais observados quando os familiares apresentavam diagnóstico de transtorno fonológico atual; os processos fonológicos observados nas crianças são, em geral, diferentes daqueles presentes no núcleo familiar, e os que são iguais não determinam características próprias de histórico familial, na medida em que são os mais freqüentemente presentes em sujeitos com transtorno fonológico; houve associação entre os processos fonológicos quando considerado o histórico familial; o índice de gravidade PCC-R não diferenciou o transtorno em relação ao histórico familial. Conclusão: a pesquisa mostrou fatores que indicam que o histórico familial de transtorno de fala e linguagem está associado ao transtorno fonológico. O conhecimento do histórico familial da criança facilita o planejamento e execução de medidas de intervenção precoce podendo prevenir os agravamentos do transtorno fonológico. O índice de gravidade PCC-R não diferencia o transtorno fonológico em relação ao histórico familial.
Palavras-Chave: Transtornos da Articulação; Testes de Articulação da Fala; Índice de Gravidade de Doença.

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Introduction

During the last years several studies have being conducted aiming to improve the speech and language assessment involved in the speech and language disorders diagnosis. Such studies have provided evidence of the great occurrence of phonological disorders, defined by the inability to use the rules of the phonological system, including the phonemes and their distribution, as well as the syllabic structure types characteristic of each language (Oliveira e Wertzner, 2000; Wertzner et al., 2001; Wertzner, 2002; Wertzner e Oliveira, 2002; Wertzner, 2003; Wertzner, 2004). This difficulty can be identified by means of the phonological processes utilized, that is, the simplifications of the phonological rules specific of each language (Peña-Brooks e Hedge, 2000).

It can be observed in studies about phonological disorders involving English as well as Portuguese speakers that its occurrence in children is very large, many of these children present severe disorders related to this system and in most of the cases the diagnosis is determined during pre-school and school years (Wertzner, 2002).

According to the variations of the correlated causes as well as the phonological characteristics of the phonological disorder they are classified in five subtypes. They are: generic speech delay, otitis media with effusion, development apraxia, psychological involvement and residual errors (Shriberg et al., 2001; Flipsen et al., 2001; Karlsson et al., 2002; Shriberg, 2002; Shriberg et al., 2003; Lewis e Shriberg, 2003; Shriberg, 2003, Hosom et al., 2004; Shriberg, 2004a, Shriberg, 2004b; Shriberg, 2004c; Lewis et al.,2004a; Raitano et al., 2004).

Studies about the gravity of the phonological disorder may help identify and classify these subtypes. Besides, by determining the initial severity index it is possible to follow up the subject's improvement during treatment.

Shriberg e Kwiatkowski (1982) created an index to determine the severity degree of the phonological disorder, the Percentage of Correct Consonants (PCC). This index verifies the number of correct consonants produced in a speech sample according to the total consonants of the sample. This way, the phonological disorder is considered mild if the PCC is between 85 and 100%, mildly moderate between 65 and 85%, moderate-severe between 50 and 65% and severe if it is bellow 50%. In this analysis omissions, substitutions and common and uncommon distortions are considered incorrect consonants. The PCC is calculated by the following formula: number of correct consonants produced by the subject, divided by the number of total consonants of the sample, multiplied by 100. The authors considered that the PCC was efficient as an indicator of the speech proficiency as well as to analyze the severity of the disorder.

Aiming to improve the differential diagnosis of the different subtypes of phonologic al disorders, Shriberg et al. (1997a, 1997b) proposed variants of the PCC, since it is already being used for clinical and research purposes. The original PCC was maintained in what refers to common and uncommon distortions, omissions and substitutions being considered errors, and than the two variants: the PCC-Adjusted (PCC-A) do not analyze common distortions as errors and the PCC-Revised (PCC-R), which do not include any kind of distortion. Each one of them has one indication, being the PCC recommended to the analysis of subjects with ages between 3:0 and 6:0 years. The PCC-A is used as a measure of comparison of the same speech involvement of all subjects with different ages. And the PCC-R is suggested to compare subjects with different ages and different speech characteristics.

Studies about the Brazilian Portuguese were conducted with this severity index aiding the assessment process and the therapy of children with phonological disorder (Wertzner et al, 2001; Pagan e Wertzner, 2002; Wertzner et al, 2004).

The cause of the phonological disorder is unknown and the severity and speech intelligibility are varied (Cumley, 2001; Wertzner et al., 2003; Wertzner et al., 2004; Keske-Soares et al., 2004, Vieira et al., 2004; Whitehead et al, 2004). This way, several authors have addressed the issue of phonological disorder's etiology considering different causes that may be related, as biological, psycho-social, environmental and, most recently, the familial aspect.

The aspect of heredity in speech and language disorders has been studied in search of some relation between the great number of subjects with this disorders that have other members of their families who present them also. Several studies show that the percentage of positive cases of language disorders within families is larger than in subjects without these disorders (Lewis et al., 1989; Shriberg et al., 2001; Karlsson et al., 2002; Flipsen et al., 2001; Bishop, 2002; Stein et al., 2004).

Lewis et al. (1989) conducted a research involving 20 children with severe phonological disorder and their siblings, compared with 20 children with normal development and their siblings.

The results show that families of children with disorders related significantly more persons with speech and language disorders.

Lewis (1990) analyzed the genealogical history of four children with severe phonological disorder and all subjects had cases of dyslexia, learning disabilities and speech disorders in their families.

In a study with 38 siblings in school age and 94 parents of children with phonological disorders, Lewis e Freebairn (1997), pointed out that 20 to 40% of the subjects with speech and language disorders presented other cases of disorders in their families.

A preliminary study about the occurrence of speech and language disorders in the families of 28 subjects with phonological disorder conducted in Brazil by Salvatti e Wertzner (1999) showed that one half of the studied population presented positive cases of these disorders in their families, mostly in the siblings.

The study conducted by Fox et al (2002) used a questionnaire to collect data about the familial question and verified that 28% of the children with speech disorders had a positive history of family disorders, most of them involving one member of the family nucleus.

Most recently Lewis et al (2004b) studied the genealogic three of 42 children with speech and language disorders with suspicion of infant speech apraxia. They found that 86% of them reported at least one member of the familial nucleus was affected and 59% of the children had at least one of the parents with speech and language complaints.

Considering the literature reviewed the present research has as objectives: verify the phonological processes used by children with phonological disorder between 3:6 and 10:2 years of age with and without history of speech and language disorders in their families. Verify the association between phonological processes used by children with phonological disorders and the members of their families. And, finally, verify if the severity index PCC-R distinguishes the phonological disorder according to the familial aspect.

Method

This research was approved by the Ethics Committee of the Institution (CAPPesq protocolo 286/99) and the consent forms were signed by a legal responsible of each subject.

Participants were 25 children with phonological disorder and their families, adding up to 104 subjects. The 25 children were attending two Speech and Language Pathology services supervised by teachers of the Speech and Language Pathology Course of the School of Medicine, University of Sao Paulo (FMUSP): the Speech and Language Pathology Research Laboratory on Phonology (LIF-Phonology) that operates in the Department of Physiotherapy, Speech-Language Pathology and Audiology and Occupational Therapy (FMUSP) and the Speech and Language Therapy Service of the Public-School-Health-Center prof. Samuel Barsnley Pessoa (CSE), under the responsibility of the School of Medicine of University of Sao Paulo.

As inclusion criteria children should be assigned with the diagnosis of phonological disorder, not have received speech and language therapy before, live with their biological parents and all family members should consent and be able toi participate in the study.

After signing the consent form, all subjects went through speech and language assessment to determine the phonological disorder diagnostic of the children and the presence of phonological disorders in other family members. Parents responded to a specific questionnaire during an interview, which allowed the determination of two groups: with and without familial history.

In this research it was used a structured interview, a questionnaire and the phonology tasks of the Teste de Linguagem Infantil ABFW (Wertzner, 2000).

The specific questionnaire included questions about the familial nucleus, determining if any of the members has, or had at some point, any complaints involving speech, language or learning performance. It also determined the characteristic of the disorder, if it was similar to the one presented by the subjects, if there was any kind of therapy and for how long.

During the application of the tasks to the family members of the children with phonological disorders the researcher sat in front of the person, with the material and register sheets placed on the table. The audio recorder was positioned so that the microphone was located near and directed to the person in order to avoid recording interferences and to allow a better phonetic transcription of the data. The video recorder was placed on a tripod focusing directly the individual that was being assessed which allowed the observation of the articulatory production and minimizing the chances of troubles for the phonetic transcription.

After the application of the phonology tasks thy were phonetically transcribedin the register sheets of the Phonology part of the ABFW

(Wertzner, 2000) and the phonological processes identified were classified by the researcher, after drilling and discussing with the judges.

After the assessment, transcription and analysis of the phonological processes, the severity index PCC-R was calculated. This index also helped to classify the families as "normal" or "with phonological disorder".

After the assessment of the family members the children were divided in four subgroups: children with family history of speech and language disorder and with phonological disorder (CDCH), children with family history and with no disorder (CDSH), children without family history and with disorder (SHCD) and children with no family history and no disorder (SDSH).

The inferential analysis used the non-parametric tests to verify the association and correlation of data of subjects and the association with the family history data. The used tests were: Fisher's exact test, with significance level of 0,10 and the correlation test of Spearman considering two significance levels (0,01 and 0,05) that were applied according to the results of the test, because the sample size of the present study was small.

Results

The speech and language assessment allow the identification of the phonological processes used by the subjects in what refers to the number of different processes used as well as the number of total occurrences in the test.

Table 1 shows which phonological processes used by the children were the same their parents used and which were different. It also identifies which were subjects whose parents also presented phonological processes.

Based on the data about the family history and assessment the children were separated in four subgroups and than the phonological processes used by the children of each subgroup were analyzed. Table 2 shows that in all subgroups the most frequent phonological process was the liquid simplification. Children of the subgroups CDCH and CDSH used more the processes of plosive and fricative devoicing when compared to the one of subgroups SDCH and SDSH.

It is possible to observe in Figure 1 that the subgroups CDCH and SDCH presented the largest numbers of maximum occurrence of phonological processes when compared to the groups with no family history.

The average of total occurrence of phonological processes presented in Figure 2 show that there is apparently no significant difference between the groups of children with and without family history but we should consider that the group with family history is three times as big as the one without family history.

Figure 3 shows a greater instability in the PCC-R of children with family history, as it can be observed comparing the average numbers.

The inferential analysis studied the association and the correlation between phonological processes used by the children and between the phonological processes presented by the children and their families with the Fisher's Exact Test and the Spearman Correlation Test. It means we verified if the presence of a given process was related to the presence of other process in the same child and in his/her family.

Results are presented according to the kind of association identified:

Os resultados serão apresentados conforme o tipo de associação detectada.

Associated phonological processes

Table 3 shows the p values on the Fisher's Exact Test (with significance level of 0,10) of the phonological processes used by the children that presented association with the phonological processes used by the family members, observing that the phonological process with more associations was the liquid simplification.

Correlated phonological processes of children

The Spearman correlation allowed the observation of which of the phonological processes used by the children presented either a strong correlation (significance level 0,01**) or a weak correlation (significance level 0,05*) according to the correlation value and confirmed by the significance level (p). In Table 4 it can be observed that six processes presented correlations, of which four were strong, with p values closer to zero.

Correlation between phonological processes presented by the children and their families

As can be observed in Table 5 all phonological processes presented by the children and their fathers presented a strong correlation. But two of them have a negative correlation, indication an

inversely proportional correlation, that is, while one of the subjects presented many devoicing processes his/her father presented less. In relation to the phonological processes presented by the children and their mothers, just two processes presented a weak correlation. Referring to the siblings, eight processes presented correlations, being two, strong ones. Of all the analyzed groups, the one with greater number of correlations was the children and their siblings.

Table 1 – Different and equal phonological processes presented by the subjects and their families.

children	Equal Processes	Different Processes
2	SEC	0
6	EP´; EF; SL	RS; HC
9	EP	SEC; SCF
10	SL; FP; RS	SEC; SP
11	SEC; SCF	0
12	RS; PF; EP	FP; EF
13	SEC; SCF	0
16	RS; SL; EP	SEC; SCF
17	EF; SCF	SL
18	SL	SEC
19	RS; SL	SEC; SCF
20	SEC; SCF	0
22	SL; SEC	SCF; HC
24	PV; SL	HC; EF

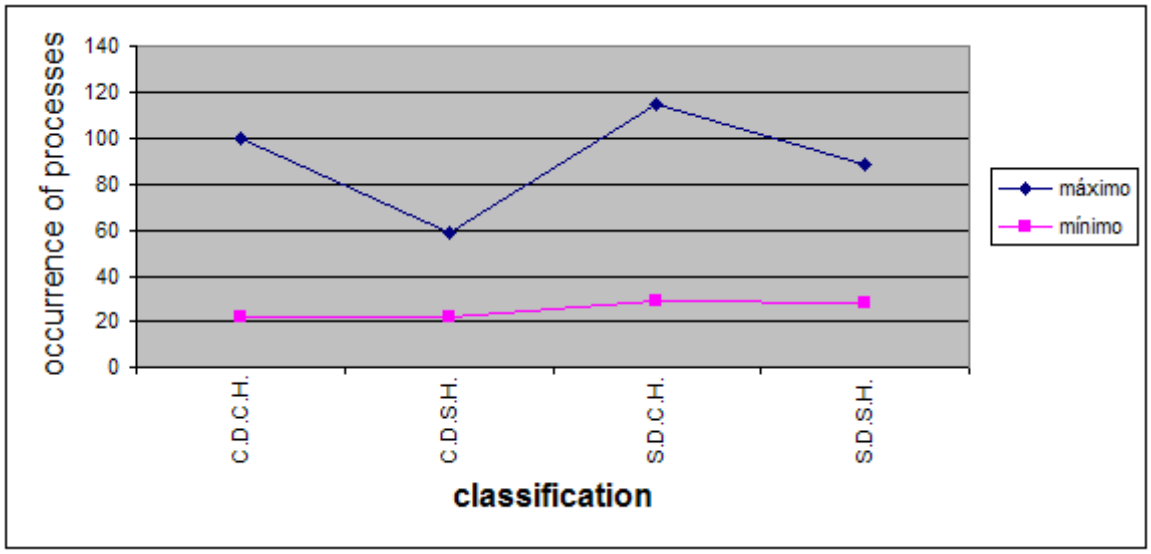
Legend: SEC- simplification of consonantal encounter; EP – plosive devoicing; EF: fricative devoicing; SL: liquid simplification; RS – syllable reduction; HC- consonantal harmony; SCF – final consonant simplification; FP – palatal frontalization; SP – plosive voicing; PF – fricative plosivation, PV – posteriorization to velar

Table 2 – Occurrence of the phonological processes in each group

	Subjec	age	Sex	RS	HC	PF	PV	PP	FV	FP	SL	SEC	SCF	SP	SF	EP	EF
	2	7;2	M	0	0	0	73	0	0	100	61	100	8,3	0	0	65	94
	6	6;6	M	0	0	0	0	0	0	0	5,5	45	0	0	0	15	44
	9	6;10	M	0	0	0	0	0	0	0	22	0	0	0	0	31	50
	10	5;1	M	1,3	0	8,8	11,5	5,5	3,7	90	100	0	0	0	0	9,3	5,5
	12	3;6	M	5,4	1,3	60	0	0	0	0	61	0	0	0	0	68	0
	13	9;0	F	0	0	0	0	0	0	0	44	60	16	0	0	0	0
	17	9;6	M	0	0	0	0	0	0	81	0	90	25	0	3,7	25	44
	22	10;2	M	0	0	0	0	0	0	0	50	65	0	0	0	0	0
	24	5;0	M	0	0	0	69	0	0	0	77	0	0	4	0	0	0
	1	7;4	F	0	0	0	0	0	0	90	16	20	8,3	0	0	71	100
	7	8;0	M	0	0	0	0	0	0	0	16	35	0	6	0	25	72
	15	5;4	F	0	0	0	3,8	16	0	18	11	0	0	2	0	9,3	0
	16	5;4	F	1,3	0	11	3,8	11	0	0	33	0	0	0	0	6,2	16
	4	5;11	M	0	0	0	0	0	0	0	50	0	0	0	0	0	0
	8	4;8	F	1,3	2,7	44	0	0	0	0	5,5	0	0	2	0	15	38
	11	8;1	F	4,1	5,4	8,8	7,6	0	0	27	27	90	58	0	0	0	0
	14	5;1	M	0	0	0	73	0	0	90	72	0	0	0	0	100	100
	18	6;5	F	0	0	0	0	0	0	0	16	0	0	40	63	0	0
	20	7;4	M	0	0	0	0	0	0	36	22	35	25	0	0	21	33
	21	5;0	M	0	0	4,4	0	33	85	18	61	0	0	0	0	0	0
	23	5;10	F	0	0	0	0	0	0	0	100	0	0	0	0	84	27
	3	6;5	M	2,7	0	44	3,8	0	3,7	81	66	0	0	0	0	37	5,5
	5	6;5	M	0	0	0	0	0	0	0	22	0	0	0	0	87	88
	19	4;9	M	1,3	0	2,2	0	77	0	0	33	0	0	0	0	0	5,5
	25	6;5	M	0	0	0	0	0	0	0	50	0	0	0	0	0	0

Legend: Data are presented in percentage. M- masculine; F - feminine ; SEC- simplification of consonantal encounter; EP – plosive devoicing; EF: fricative devoicing; SL: liquid simplification; RS – syllable reduction; HC- consonantal harmony; SCF – final consonant simplification; FP – palatal frontalization; SP – plosive voicing; PF – fricative plosivation, PV – posteriorization to velar; PP – posteriorization to palatal; FV – velar frontalizatioon; SF – fricative voicing

Figure 1 – Maximum and minimum occurrence of phonological processes presented in each subgroup



Legend:

CDCH – Group of subjects with parents with disorder and with history; CDSH – Group of subjects with parents with disorder and without history; SDCH – Group of subjects with parents without disorder and with history; SDSH – Group of subjects with parents without disorder and without history

Figure 2 – Comparison of the average of total occurrences of phonological processes between subjects with phonological disorder with and without family history of speech and language disorders.

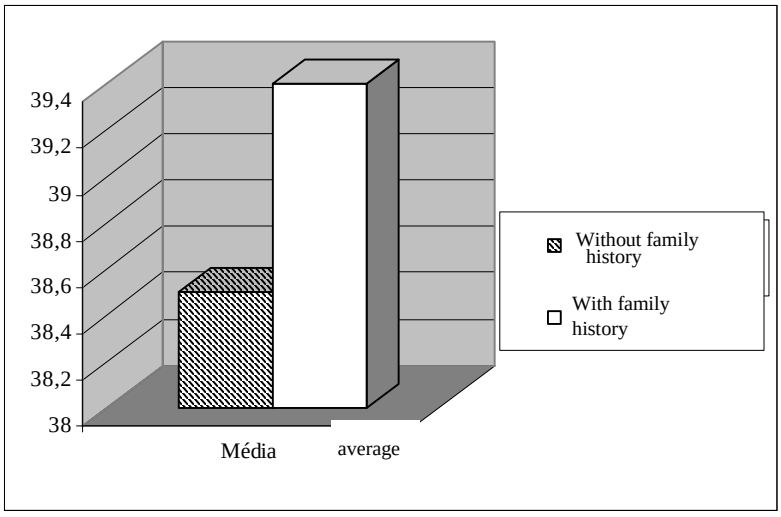


Figure 3 – Comparison of the PCC-R average results between subjects with phonological disorder with and without family history of speech and language disorders.

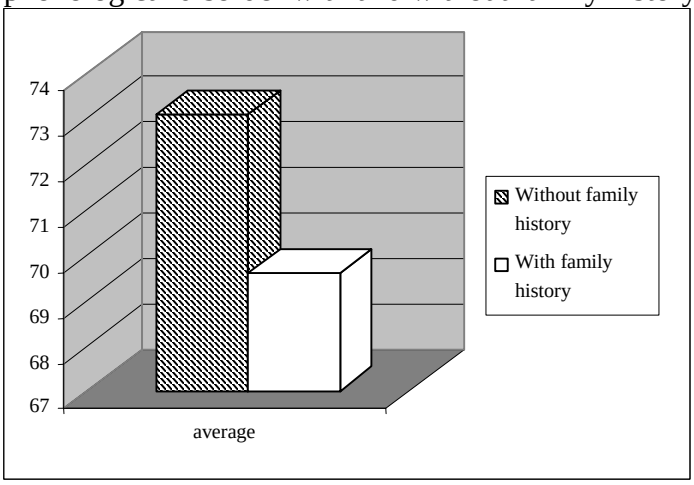


Table 3 – Association between phonological processes of subjects with phonological disorder and their families

Subjects' phonological processes	Familys' phonological processses	P values
PP	RS	0,01
FP	SCF	0,02
RS	RS	0,03
SL	EF	0,03
EP	EP	0,04
PF	RS	0,05
SL	EP	0,05
PV	SCF	0,07
SL	PF	0,08
EP	SCF	0,09
FP	SEC	0,10

Legend: RS – syllabe reduction; PF – fricative plosivation; PV – posteriorization to velar; PP – posteriorization to palatal; FP – frontalization to palatal; SL – liquid simplification; SEC – consonantal encounter simplification; SCF – Final consonant simplification; EP – plosive devoicing; EF – fricative devoicing

Table 4 – Spearman correlation between phonological processes of subjects with phonological disorder

Phonological Processes	**Spearman's correlation**	**P value**
RS X PF	0,93(**)	0,000
PV X FP	0,55(**)	0,005
PV X SL	0,49(*)	0,013
FP X SCF	0,50 (*)	0,011
SEC X SCF	0,76(**)	0,000
EP X EF	0,78(**)	0,000

Legend: (**) – 0,01; (*) – 0,05; RS – RS – syllabe reduction; PF – fricative plosivation; PV – posteriorization to velar; FP – frontalization to palatal; SL – liquid simplification; SCF – Final consonant simplification; EP – plosive devoicing; EF – fricative devoicing

Table 5 – Spearman's correlation between phonological processes of subjects and their families

	Phonologic processes	Spearman's correlation	P value
Fathers	PP X RS	0,49(*)	0,014
	PP X SL	0,42(*)	0,037
	SCF X EF	0,40(*)	0,049
	SP X HC	0,41(*)	0,045
	EP X EP	-0,42(*)	0,037
	EF X EP	-0,40(*)	0,050
Mothers	PP X RS	0,45(*)	0,023
	PP X SCF	0,49(*)	0,014
Siblings	RS X RS	0,44(*)	0,400
	RS X PF	0,49(*)	0,200
	PF X PF	0,49(*)	0,200
	PP X RS	0,61(**)	0,002
	PP X SP	0,50(*)	0,021
	SL X EP	0,58(**)	0,005
	SEC X HC	0,43(*)	0,044
	SP X SF	0,45(*)	0,038

Legend: (**) – 0,01; (*) – 0,05; RS – syllabe reduction; HC – consonantal harmony; PF – fricative plosivation; PP – posteriorization to palatal; SL – liquid simplification; SEC – consonantal encounter simplification; SCF – Final consonant simplification; EP – plosive devoicing; SP –plosive voicing; SF – fricative voicing;

Discusion

As shown by the literature the severity degree of phonological disorders is variable (Shiriberg e Kwiatkowski, 1982; Shriberg et al., 1997a, 1997b) and the present research confirmed this notion based on the analysis of the phonological assessment of children. It was verified that the children presented a PCC-R variation ranging from mild to severe, respectively, 89,70% and 41,12%. Despite the results, clinically both results suggest the need of speech and language therapeutic intervention because the phonological disorders interfere with speech intelligibility.

The fact that there are more children with family history and that they present more phonological instabilities lead to the suggestion of procedures that might be incorporated to pediatrician's and teacher's routines. Such procedures could include simple questions helping the early detection and avoiding increases of phonological disorders. For example: Do you understand everything your son/ daughter speaks? Who else understands? Anyone in the family have speech problems?

All these data show that in this population the severity index didn't distinguish the presence of familial issues. Since the PCC-R is designed to be

used with different ages and disorders and do not include distortions as errors, it can be stated that the investigated groups present similar omissions and substitutions.

Considering the likelihood of the phonological processes used by the children and their families, it was observed that in most cases the processes used were different. In the cases they were the same it could be noted that the processes were usually the ones more common in subjects with phonological disorder.

In the general population with phonological disorder the use of phonological processes is varied. There is interdependency on individual experience as well as on the language construction path, since they do not present important cognitive deficits (Elbert e Gierut, 1986). It can be one of the factors justifying the phonological differences observed between the subjects and the members of their families.

Data analyzed through the division of subjects in four subgroups based on number of subjects and the occurrence of phonological processes, reinforce the familial aspect. It shows the importance of the follow-up of children from families with phonological disorders. The pediatrician can investigate the issue provide the correct professional indication and thus helping the early diagnosis and disorder prevention.

Liquid simplification was the most used phonological process in all subgroups. It shows this is the most frequent phonological process in general population, regardless of the familial history. The subgroups with families with phonological disorder were the ones that used plosive and fricative devoicing processes more frequently. The devoicing process is one of the most frequent in the population with phonological disorder (Wertzner, 2002). The fact that it is possible to observe occurrence association of this process in children and their families points to an important diagnostic characteristic, showing that this processes is very difficult to eliminate due to their production characteristics, as vocal cords vibration and voicing perception. The association of its presence in subjects and their families may point to the familial aspect more clearly than the liquid simplification that appears in all subjects.

Once the phonological process of liquid simplification is the more frequent in the population with phonological disorder its association with other processes is also larger. The presence of this process is associated with other processes common in early developmental periods showing that, in general, liquid simplification occurs together with other processes that suggest greater difficulties in overcoming the disorder without intervention.

The phonological processes that present correlations, weak or strong, are characteristic of the same phonological acquisition age-range, reinforcing the diagnosis as the child's chronological age is confirmed. It will be useful to the speech and language intervention allowing a prognostic perspective.

Conclusion

The research realized verified that there are factors that indicate that the history of speech and language disorders in families is associated to phonological disorder, because some of the phonological disorders are associated and their occurrence is expected in the family nucleus. This way, with some control over the family's speech and language disorders' history, it can be predicted if the child has the possibility of developing phonological disorder and which are the processes he/she is more likely to use. Then it can be suggested early intervention measures to prevent the disorder's aggravation.

The PCC-R severity index did not distinguish the phonological disorder in the studied population in relation to familial history.

References

BISHOP, D.V. M. The role of genes in the etiology of specific language impairment. *J. Commun. Dis.*, v. 35, p. 311-328, 2002.

CUMLEY, G. D. *Children with apraxia and the use of augmentative and alternative communication:* Introduction. Apraxia-Kids sm. aug. 2001. Disponível em: <http://www.apraxia-kids.org/slps/cumley.html>. Acesso em: 04 jan. 2002.

ELBERT, M.; GIERUT, J. *Handbook of clinical phonology:* Approaches to assessment and treatment. 2. ed. Austin: Pro-ed, 1986.

FLIPSEN JR, P.; SHRIBERG, L. D.; WEISMER, G.; KARLSSON, H. B.; McSWEENY, J. L. Acoustic phenotypes for speech-genetics studies: Reference data for residual /Z / distortions. *Clin. Ling. Phonetics*, v. 15, n. 8, p. 603-630, 2001.

FOX, A. V.; DODD, B.; HOWARD, D. Risk factors for speech disorders in children. J. Lang. Commun. Dis., v. 37, n. 2, p. 117-131, 2002.

HOSOM, J. P.; SHRIBERG, L.; GREEN, J. R. Diagnostic assessment of childhood apraxia of speech using Automatic Speech Recognition (ASR) methods. *J. Med. Speech Lang. Pathol.*, v. 12, p. 167-171, 2004.

KARLSSON, H. B.; SHRIBERG, L. D.; FLIPSEN JR, P.; McSWEENY, J. L. Acoustic phenotypes for speech-genetics studies: Toward and acoustic marker for residual /s/ distortions. *Clin. Ling. Phonetics*, v. 16, n. 6, p. 403-424, 2002.

KESKE-SOARES, M.; BLANCO, A. P. F.; MOTA, H. B. O desvio fonológico caracterizado por índices de substituição e omissão. *R. Bras. Fonoaudiol.*, São Paulo, v. 9, n. 1, p. 10-18, jan.-mar. 2004.

LEWIS, B. A.; EKELMAN, B. L.; ARAM, D. M. A familial study of severe phonological disorders. *J. Speech Hear. Res.*, v. 32, p. 713-724, 1989.

LEWIS, B. A. Familial phonological disorders: four pedigrees. *J. Speech Hear. Dis.*, v. 55, n. 1, p. 160-170, 1990.

LEWIS, B. A.; FREEBAIRN, L. Speech production skills of nuclear family members of children with phonology disorders. *Lang. Speech*, v. 41, n. 1, p. 45-61, 1997.

LEWIS, B. A.; SHRIBERG, L. D. Genetic research in speech sound disorders: phenotype issues and recent fidings. In: ANNUAL CONVENTION OF THE AMERICAN SPEECH-LANGUAGE-HEARING ASSOCIATION, 2., 2003. Chicago. *Paper Presented...* Chicago: [s.n.], 2003.

LEWIS, B. A.; FREEBAIRN, L. A.; HANSEN, A. J.; IYENGAR, S. K.; TAYLOR, H. G. School-age follow-up of children with childhood apraxia of speech. *Lang. Speech Hear. Serv. Sch.*, v. 35, n. 2, p. 122-40, 2004a.

LEWIS, B. A.; FREEBAIRN, L.; HANSEN, M.; TAYLOR, H. G.; IYENGAR, S.; SHRIBERG, L. D. Family pedigrees of children with suspected childhood apraxia of speech. *J. Commun. Dis.*, São Paulo, v. 37, p. 157-175, 2004b.

OLIVEIRA, M. M. F.; WERTZNER, H. F. Estudo do distúrbio fonológico em crianças. *R. Soc. Bras. Fonoaudiol.*, v. 7, p. 68-75, set.-dez. 2000.

PAGAN, L. O.; WERTZNER, H. F. Intervenção no distúrbio fonológico através dos pares mínimos com oposição máxima. *Pró-Fono R. Atual. Cient.*, Barueri (SP), v. 14, n. 3, p. 313-324, 2002.

PEÑA-BROOKS, A.; HEDGE, M. N. *Assessment and treatment of articulation and phonological disorders in children.* Austin: Pro Ed, 2000.

RAITANO, N. A.; PENNINGTON, B. F.; TUNICK, R. A.; BOADA, R.; SHRIBERG, L. D. Pre-literacy skills of subgroups of children with speech sound disoreders. *J. Child Psychol. Psychiat.*, v. 45, n. 4, p. 821-835, 2004.

SALVATTI, A. C. C.; WERTZNER, H. F. Ocorrência de distúrbio de fala e linguagem em familiares de sujeitos com distúrbio fonológico. In: CONGRESSO INTERNACIONAL DE FONOAUDIOLOGIA, 4., ENCONTRO IBERO-AMERICANO DE FONOAUDIOLOGIA, 3., 1999, São Paulo. *Anais...* São Paulo: [s.n.], 1999. p. 76.

SHRIBERG, L. D.; KWIATKOWSKI, J. Phonological disorders: I: A diagnostic classification system. *J. Speech Hear. Dis.*, v. 47, p. 226-241, 3 ago. 1982.

SHRIBERG, L. D.; AUSTIN, D.; LEWIS, B. A.; MCSWEENY, J. L.; WILSON, D. L. Developmental apraxia of speech: II: Toward a diagnostic marker. *J. Speech Lang. Hear. Res.*, v. 40, p. 286-312, 1997a.

SHRIBERG, L. D.; AUSTIN, D.; LEWIS, B. A.; MCSWEENY, J. L.; WILSON, D. L. The percentage of consoants correct (PCC) metric: Extensions and reability data. *J. Speech Lang. Hear. Res.*, v. 40, p. 708-722, 1997b.

SHRIBERG, L. D.; FLIPSEN JR, P.; KARLSSON, H. B.; McSWEENY, J. L. Acoustic phenotypes for speech-genetics studies: An acoustic marker for residual /Z / distortions. *Clin. Ling. Phonet.*, v. 15, n. 8, p. 631-650, 2001.

SHRIBERG, L. D. Classification and misclassification of child speech sound disorders. In: ANNUAL CONVENTION OF THE AMERICAN SPEECH-LANGUAGE-HEARING ASSOCIATION, 2002, Atlanta (GA). nov. 2002. Disponível em: <http://www.waisman.wisc.edu/phonology>. Acesso em: 12 jun. 2003.

SHRIBERG, L. D.; FLIPSEN JR, P.; KWIATKOWSKI, J.; McSWEENY, J. L. A diagnostic marker for speech delay associated with otitis media with effusion: the intelligibility-speech gap. *Clin. Ling. Phonet.*, v. 17, n. 7, p. 507-528, 2003.

SHRIBERG, L. D. Phenotypes, endophenotypes, and phenocopies in speech-genetics research. In: ANNUAL CONVENTION OF THE AMERICAN SPEECH-LANGUAGE-HEARING ASSOCIATION, 2003, Chicago (IL). Chicago: American Speech-Language-Hearing Association, nov. 2003. Disponível em: <http://www.waisman.wisc.edu/phonology>. Acesso em: 10 jan. 2004.

SHRIBERG, L. D. Phenotype markers for genetically transmitted speech sound disorder. In: The 10th SYMPOSIUM OF THE INTERNATIONAL CLINICAL PHONETICS AND LINGUISTICS ASSOCIATION, 10., feb. 2004a, Lafayette (Lousiana). Disponível em:<http://www.waisman.wisc.edu/phonology>. Acesso em: 6 jun. 2004.

SHRIBERG, L.D. Diagnostic classification of five subtypes of childhood speech sound disorders (SSD) of currently unknown origin. In: IALP CONGRESS, 2004b, Brisbane (Queensland). aug. 2004b. Disponível em:<http://www.waisman.wisc.edu/phonology>. Acesso em: 15 nov. 2004.

SHRIBERG, L.D. Verbal dyspraxia and other speech production disorders: Where are the Diagnostic Boundaries? In: 16th ANNUAL MEETING OF THE EUROPEAN ACADEMY OF CHILDHOOD DISABILITY, 16., 2004c, Edinburgh (Scotland-UK). oct. 2004c. Disponível em:<http://www.waisman.wisc.edu/phonology>. Acesso em: 15 nov. 2004.

STEIN, C. M.; SCHICK, J. H.; GERRY TAYLOR, H.; SHRIBERG, L. D.; MILLARD, C.; KUNDTZ-KLUGE, A.; RUSSO, K.; MINICH, N.; HANSEN, A.; FREEBAIRN, L. A.; ELSTON, R. C.; LEWIS, B. A.; IYENGAR, S. K. Pleiotropic effects of a chromosome 3 locus on speech-sound disorder and reading. *Am. J. Hum. Genet.*, Sãp Paulo, v. 74, n. 2, p. 283-297, jul.-set. 2004.

VIEIRA, M. G.; MOTA, H. B.; KESKE-SOARES, M. Relação entre idade, grau de severidade do desvio fonológico e consciência fonológica. *R. Soc. Bras. Fonoaudiol.*, v. 9, n. 3, p. 144-150, 2004.

WERTZNER, H. F. Fonologia. In: ANDRADE, C. R. F.; BEFI-LOPES, D. M.; FERNANDES, F. D. M.; WERTZNER, H. F. *ABFW*: Teste de linguagem infantil nas áreas de fonologia, vocabulário, fluência e pragmática. Carapicuíba (SP): Pró-Fono, 2000. cap. 1, p. 5-40.

WERTZNER, H. F.; HERRERO, S. F.; PIRES, S. C. F.; IDERIHA, P. N. Classificação do distúrbio fonológico por meio de duas medidas de análise: Porcentagem de consoantes corretas (PCC) e índice de ocorrências dos processos (PDI). *Pró-Fono R. Atual. Cient.*, Carapicuíba (SP), v. 13, n. 1, p. 90-97, mar. 2001.

WERTZNER, H. F.; OLIVEIRA, M. M. F. Existem semelhanças entre os sujeitos com distúrbio fonológico? *Pró-Fono R. Atual. Cient.*, Carapicuíba (SP), v. 14, n. 2, p. 143-152, maio-ago. 2002.

WERTZNER, H. F. *O distúrbio fonológico em crianças falantes do português:* descrição e medidas de severidade. 2002. 228 f. Tese (Livre-Docência, Departamento de Fisioterapia, Fonoaudiologia e Terapia Ocupacional) - Faculdade de Medicina, Universidade de São Paulo, São Paulo.

WERTZNER, H. F. Distúrbio Fonológico. In: ANDRADE, C. R. F.; MARCONDES, E. (Org.). *Fonoaudiologia em Pediatria.* 1. ed. São Paulo: Savier, 2003. p.70-78, parte 1.

WERTZNER, H. F.; AMARO, L.; SCHOLZ, S. Índice de inteligibilidade e classificação perceptiva da inteligibilidade de fala no distúrbio fonológico. In: CONGRESSO BRASILEIRO DE FONOAUDIOLOGIA, 11., 2003, Fortaleza (CE). *Anais...* Fortaleza (CE): [s.n.], 2003.

WERTZNER, H. F.; AMARO, L.; TERAMOTO, S. Descritores da classificação da gravidade do distúrbio fonologico. *Pró-fono R. Atual. Cient.*, Barueri (SP), v. 16, n. 2, p. 139-150, maio-ago. 2004.

WERTZNER, H. F. Fonologia: desenvolvimento e alterações. In: FERREIRA, L. P.; BEFI-LOPES, D. M.; LIMONGI, S. C. O. (Org.). *Tratado de Fonoaudiologia*. 1. ed. São Paulo: Roca, 2004. p. 772-786.

WHITEHEAD, R. L.; SCHIAVETTI, N.; MACKENZIE, D. J.; METZ, D. E. Intelligibility of speech produced during simultaneous communication. *J. Commun. Dis.*, v. 37, n. 3, p. 241-253, 2004.