

ORAL LANGUAGE DISORDERS IN CHILDREN FROM 4 TO 6 YEARS OLD IN BELO HORIZONTE

Alterações da linguagem oral no nível fonológico/fonético em crianças de 4 a 6 anos residentes em belo horizonte

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ABSTRACT

Purpose: to verify the prevalence of oral language disorders in children from four to six years old and its association with variables age, gender, orofacial motor skills impairments and auditory processing disorders. **Methods:** three evaluation protocols were used: stomatognathic system protocol adapted from the Myofunctional Evaluation Guidelines, the Phonology task of the ABFW – Child Language Test and a simplified auditory processing evaluation. Data were statistically analyzed using the chi-square test to compare proportions and analysis of variance to compare means and 5% ($p < 0.05$) was considered as a threshold of statistical significance. **Results:** 242 children from 4 years to 6 years and 11 months old were assessed. The prevalence of 36.0% ($n=87$) of oral language disorders and an association with age group with statistical significance ($p=0.009$) were found. We observed a statistically significant association between phonological deviation and age ($p < 0.001$); between the presence of phonetic deviation and orofacial motor skills impairments ($p < 0.001$) and the presence of phonological deviation and auditory processing disorders ($p < 0.001$). **Conclusion:** the high prevalence of deviations observed shows the need for developing actions in primary health care in order to prevent the onset of these disorders, improve access to intervention and enable prevention of more serious problems in school. The highest occurrence of oral language disorders at the age group of four to five years old suggests that this is a good stage for the identification and prevention of these deviations.

KEYWORDS: Speech, Language and Hearing Sciences; Child Health; Child Development; Primary Health Care; Child Language; Speech Disorders

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■ INTRODUCTION

Communication aims to transmit messages. It can occur through many different channels such as writing, gestures and sounds. For its occurrence, there must be a message, a sender and a receiver, a channel, a code and a reference (context, situation and real objects to which the message refers). The main channel of human communication is speech, i.e., the transmission of a message

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through the production and reception of sounds that constitute it¹.

Speech can be defined as the motor act or physical event that expresses the language. For the speech to occur it is required the structural integrity of the central nervous system and peripheral structures involved in four functions that must act in an integrated way: breathing, phonation, articulation and resonance. In addition, cognitive and phonological developments should be adequate²⁻⁴.

The spoken language has several implications in cognitive development: it allows you to communicate with others, initiates socialization, the internalization of the word for the formation of thought, and the formation of mental images, representations of the meanings of signs⁵. In turn, these representations allow experiences to occur more rapidly, leading to the development of language⁶.

Speech intelligibility i.e. the fact that the words are well pronounced is a decisive factor in the process of message transmission. For speech to be intelligible, the child must learn to produce contrastive sounds that are part of your mother tongue well².

Preschool is the period of greatest development of the phonological system, when quantitative and qualitative changes are noticed. At first the children have a limited inventory of speech sounds and, approximately at the age of five, there is already a complete phonological system. This moment is also the beginning of syntactic development, when a significant expansion of vocabulary happens, reaching approximately 8000 words at the age of five. In this period, the grammatical forms of the language are already there and the subjects are able to use language to communicate effectively⁷.

Studies on the phonological acquisition of Portuguese speakers in Brazil show that children at about four or five years old have already acquired phonemic contrasts of an adult speaker and the period of acquisition of phonological rules ends around the age of six, with the acquisition of the last sounds⁸⁻¹³.

The timely detection of speech disorders and impairments of skills and structures associated with these disorders is the best way to increase the chances of access to adequate and timely treatment and to decrease the chances that these disorders may negatively impact the social relations of the individual. Therefore, it is possible for the individual to experience better quality of life¹⁴.

Thus, given the above, this article aims to study the disorders of speech, and its association with age, gender and presence of auditory processing disorders and orofacial motor skills impairments in children from four to six years old, enrolled in

kindergarten in the of the catchment area of a health center in Belo Horizonte.

■ METHODS

This project was approved by the Research Ethics Committee of UFMG (opinion ETIC 263/08 of 18/06/2008).

It is a cross-sectional study conducted from September 2009 to May 2010. We studied children from four to six years and 11 months old in both genders enrolled in six public schools in the catchment area of a health center in Belo Horizonte. This area comprises a population of approximately 12,500 inhabitants, and the health center is responsible for the health of this population.

A representative random sample stratified by school and age group was constituted based on a universe of 664 children enrolled in the schools selected for the study. The following parameters were taken as the basis for calculating the sample: 40% prevalence of speech disorders, margin of error of 5%, confidence interval of 95% and 10% of losses added totaling 261 children^{3,15-18}.

Children were randomly selected through the lists of students enrolled and the date of birth of the same. Inclusion criteria were: age between four and six years and 11 months, being enrolled in a school or day care included in the survey and presenting the Informed Consent Form (ICF) signed by a parent or legal guardian of the child, agreeing with the participation of the minor. Exclusion criterion was the presence of severe comorbidities that would prevent the tests for being performed such as chronic nonprogressive encephalopathy, trisomy 21 and cleft palate.

Each child drawn was identified by a number and information on birth date, age, school and school period. Assessments lasted approximately 30 minutes and were conducted in the school environment, in a room assigned by the school. The class schedule and availability of each class, as well as the school, were respected. Each child was evaluated by a speech therapist trained for the study, one of three researchers participating in the collection of information.

For the assessment of oral language the Phonology task of the ABFW – Child Language Test – Part I was used and the analysis was conducted according to the standards of application of the test¹⁹. The assessment consists of two tests: naming and imitation, in which the child's speech is recorded by means of phonetic transcription made by the speech therapist during test application for further analysis¹⁹. The word lists used are balanced for all

phonemes and appear in all possible positions for each phoneme of Brazilian Portuguese.

The Phonology task of the ABFW – Child Language Test is widely used in clinical practice and research to verify the acquisition and development of the phonological and phonetic inventory of children from the age of three. Since it is easily applied and validated for the verification of speech disorders – phonetic and phonological deviations for Brazilian Portuguese speaking population, this test was chosen for this study¹⁹.

We opted for the use of the term ‘oral language’ when treated jointly phonetic deviations, characterized by disorders in the articulation of sounds, and phonological deviations which are language disorders characterized by the presence of productive asynchronous phonological processes (in older age group than that of overcoming this same process for most children), and/or the presence of unusual phonological processes (which are not observed in normal acquisition of the phonological system), in the child’s speech.

We also performed evaluation of orofacial motor skills (OM) impairments and auditory processing disorders in order to verify possible associations between different speech-language disorders studied. To evaluate the orofacial motor skills we drafted a stomatognathic system protocol adapted from the Myofunctional Evaluation Guidelines for verifying myofunctional aspects of the stomatognathic system²⁰. The protocol used does not define normal standards and criteria for the analysis of results, and the disorders are defined by the speech therapist’s observations from their clinical experience. Thus, the criteria for which the child was considered to have an OM impairment were defined by consensus of four speech therapists, considering the number of structures affected, the characteristics aspect, tension and mobility and its possible repercussions on other oral functions. The evaluation result was defined as a dichotomous variable: impaired or not impaired.

The simplified auditory processing evaluation consisted of the following tests: (1) Sequential Memory Test for Non-verbal sounds, (2) Sequential Memory Test for Verbal Sounds, (3) Sound Location Test^{21,22}. The choice of tests for the simplified evaluation was proposed based on the assessment described in the literature^{21,22}. The tests were chosen for being of quick and easy application, validated for

checking the disorders studied and not requiring sophisticated equipment. Faced with the impossibility of assessing hearing thresholds using pure tone audiometry, we chose to conduct the cochleo-eyelid reflex evaluation for the exclusion of children with hearing loss from moderate to severe. The criteria for application and analysis of the results complied with the rules defined by the tests^{21,22}. The results were categorized into a dichotomous variable, being considered impaired when the child had impaired result in at least one of three tests.

Those responsible for children selected for the study were explained and informed about all research procedures by means of written information (Statement of Consent). The IC was delivered to children in school to be signed by a parent or guardian. Children who did not return the signed document after two attempts to contact by letter and one telephone contact were considered excluded.

After diagnosis, feedback was given by letter to the children with not impaired results. For the children who showed deviations, the parents were invited to attend the school for feedback interview, and the same were referred to the health center for pediatric care, guidance and referrals when necessary.

To maintain confidentiality, the schools were identified by numbers.

Data were stored in electronic format. To compare proportions, we used the chi-square test and to compare means we used analysis of variance. For continuous variables that did not present a Gaussian distribution we used the Kruskal Wallis median test. We established 5% ($p < 0.05$) as the threshold for statistical significance.

■ RESULTS

The sample size calculation included 261 children. We evaluated and analyzed the results of 242 children, which represented 7.27% of losses. These losses included children who did not return the consent form signed by a parent or guardian, after three attempts.

The children’s ages ranged from four to six years and 11 months. The median age was 5.7 years and the mean was 5.6 (± 0.8). Table 1 shows the main characteristics of the children in the study.

Table 1 – Characterization of the study population in terms of age, gender and school in the period 2009/2010, Belo Horizonte

Characteristics	N	%
Age group		
≥ 4 years and < 5 years	67	27.7
≥ 5 years and < 6 years	88	36.3
≥ 6 years and < 7 years	87	36.0
Gender		
Male	140	57.9
Female	102	42.1
School		
School 1	49	20.2
School 2	53	21.9
School 3	20	8.3
School 4	36	14.9
School 5	21	8.7
School 6	63	26.0
Total	242	100

Prevalence of 36.0% (n=87) of language disorders, 19.0% (n=46) orofacial motor skills impairments and 39.0% (n = 92) of auditory processing disorders were observed.

Of 242 children evaluated, 13.6% (n=33) showed phonological deviations, 16.1% (n=39), phonetic deviations and concomitant presence of phonetic and phonological deviations was observed in 6.2% (n=15) of the sample.

Among the 87 children with oral language disorder, we note that 44.8% had phonetic deviations, which was the most prevalent disorder found. In addition, 37.9% of children in this group had phonological deviation and 17.3%, both disorders (Table 2).

Among the 39 children who had phonetic deviations alone, we observed that more than half showed distortion of phone [s] (lisp or lateral lisp).

The substitution process was more prevalent in children with phonological deviations alone or not. Of the 33 children with phonological deviation alone, 24 (72.7%) showed this process. It was also observed that 12 (80.0%) of 15 children who had both deviations had substitution processes.

Table 3 shows the distribution of oral language disorders arranged by age and gender. We noticed a higher frequency of children with impaired oral language – including phonetic and phonological deviations – among children aged four to five years, with statistical significance (p=0.009). We observed that more than half (50.7%) of these children had these disorders, which did not occur in other age groups. The same was observed when analyzing the presence of phonological disorders alone (p<0.001).

Table 2 – Distribution of oral language/speech disorders in the period 2009/2010, Belo Horizonte (N=87)

Deviation	N	%
Phonetic deviation	39	44.8
Distortion phoneme /s/	10	11.5
Distortion other phonemes	19	21.8
Distortion phoneme /s/ + Distortion other phonemes	10	11.5
Phonological deviation	33	37.9
Simplification	9	10.3
Substitution	11	12.6
Simplification + substitution	7	8.1
Simplification + substitution + unusual	6	6.9
Phonetic deviation + Phonological deviation	15	17.3
Distortion + Simplification	2	2.3
Distortion + Substitution	5	5.7
Distortion + Unusual	1	1.2
Distortion + Simplification + Substitution	4	4.6
Distortion + Substitution + unusual	1	1.2
Distortion + Simplification + Substitution + unusual	2	2.3

Table 3 – Distribution of oral language /speech disorders in terms of age group and gender in the period 2009/2010, Belo Horizonte (N=242)

Variables	Age Group (N)			Gender (N)	
	≥4 e <5	≥5 e <6	≥6 e <7	Male	Female
Oral Language Disorders					
Yes (n=87)	34	29	24	50	37
No (n=155)	33	59	63	90	65
p-value(*)		0.009			0.963
Phonological Deviation alone					
Yes (n=33)	19	8	6	20	13
No (n=209)	48	80	81	120	89
p-value(*)		0.000			0.876
Phonetic Deviation alone					
Yes (n=39)	10	14	15	18	21
No (n=203)	57	74	72	122	81
p-value(*)		0.925			0.150
Phonological + Phonetic Deviation					
Yes (n=15)	5	7	3	12	3
No (n=227)	62	81	84	128	99
p-value(*)		0.410			0.127

(*)Chi-Squared test

When we investigated the relationship between the deviations of oral language and other speech-language disorders, there was a significant association between phonetic deviation and orofacial motor skills impairments ($p < 0.001$).

It was also observed statistically significant association between phonological deviation and auditory processing disorders ($p < 0.001$).

The prevalence of failure in the simplified auditory processing evaluation was 39.0% ($n=92$), among a total of 236 children, since six were excluded only for the analysis of auditory processing: five children who refused to perform the test for fear of putting on the mask, which prevented the testing of non-verbal sequential memory and sound localization from being held, and a child who had oral language disorder precluding the test of sequential memory for verbal sounds. We verified a predominance of failure in the test for sequential memory for verbal sounds, observed in 58 (73.3%) of these 92 children.

Regarding OM, there was 19.0% ($n=46$) of prevalence of impairments which represent children who had inadequate tension, mobility and positioning of the articulators and those who had abnormal bite and occlusion concurrently or not.

It was observed that 80.0% ($n=124$) of children without oral language disorders had one or more productive phonological processes considered normal for age according to the ABFW test analysis¹⁹. The most frequent productive phonological processes in this population were simplification of final consonant and consonant cluster simplification.

■ DISCUSSION

These results suggest a high prevalence of oral language disorders – phonetic and phonological in preschoolers. Studies in different places of the Brazilian territory including all or part of the age group of four to six years show a prevalence ranging from 21.0% to 45.2% for oral language disorders^{3,16,18}, 9.2% to 18.6% for phonological deviations^{16,23,24}, and 2.10% to 22.5% for phonetic deviations²³⁻²⁶. This large variation is probably due to methodological differences and age of children in the sample of each study, making it difficult to compare results.

Among phonetic deviations, phone [s] distortion was the most prevalent, which is also cited in the literature. The sibilant sounds are the most affected by abnormal occlusal this being, in many cases, the cause of problems in speech articulation^{13,27}.

Findings related to phonological processes are also consistent with the findings in the literature, where the most prevalent were phonological

processes involving substitutions^{17,24,28}. There was also a high prevalence of simplification processes, which is also in accordance with the results of other studies²⁹⁻³¹.

In this study we did not observe statistically significant association between oral language disorders and gender. Some studies indicate a higher prevalence in males, especially related to phonological deviation^{15,16,29} while others relate similar proportion among different genders^{3,17,26}.

The results indicate a greater number of children with oral language disorders at the age group of four to five years. The same was observed when analyzing the presence of phonological disorders. The literature shows a higher possibility of failure of younger children in tests of speech and auditory skills. Even with the possibility of overcoming the disorders without intervention, studies indicate that these children must be followed, as they present results short from expected for age and the possibility of difficulty aggravation and/or impact of other skills such as mastery of written language. These children have lower performance than the normal range found in the healthy population^{7, 12,19,21,30}.

In the analysis of the relationship between the deviations of oral language and other speech-language disorders, we observed statistically significant association between phonological and auditory processing disorders. This association was observed in other studies that indicate that children with inadequate auditory processing may present difficulties in discriminating sounds and temporal processing during speech acquisition, leading to omissions and substitutions of phonemes, characterized as phonological deviation. Researchers indicate that impairments in phonemic discrimination, working memory, auditory processing and acoustic reflexes are commonly associated with phonological deviation³²⁻³⁵.

Another study shows that 70% of children aged four to six years and with phonological disorders have failed at least one of the tests of a simplified evaluation of auditory processing, with a predominance of failure in sequential memory for verbal sounds test, results which are similar to those in this paper³³.

It is stated that the integrity and proper functioning of the auditory structures are prerequisites for the acquisition and development of language, within the normal range. The functions of attention, detection, discrimination, location, memory, sorting and integration of sounds are essential for the child to understand the details of the sound information, understand them and produce speech. Listening quality is conducive to good language development as well as a fluctuating hearing can

interfere with the performance of oral and written communication^{1,7,12,21,29,35}.

The articulation of speech sounds is linked to the development and maturation of sensory-motor-oral system and the stomatognathic functions of breathing, sucking, chewing and swallowing²⁷. The occurrence of oral language disorders in preschoolers may result from dysfunction of the stomatognathic system, since the integration of motor, sensory and auditory systems is essential for the development of motor control of speech production, which depends directly on maturation of neuronal and skeletal muscle growth during the first two years³⁶. Furthermore, it is worth noting that the presence of prolonged sucking habits, apart from breastfeeding, can affect speech development in young children, as the structures of the stomatognathic system are influenced by these habits and anatomical changes that impair the articulation of sounds may occur^{37,38}.

Another interesting finding of this study was the high number of children without oral language disorders that had some productive synchronic phonological process (considered normal for age) according to the test analysis, with the predominance of processes of final consonant simplification and consonant cluster simplification. In oral language evaluation of 95 children with an average age of five years and four months, in the northwest of the state capital, presence of consonant cluster simplification was observed in 24 children and the process of simplification of final consonant in 20 children¹⁷. In some surveys, these simplifications are considered linguistic variations of the population, as they also appear in adult speech. Study of children from 1st to 4th grade, from the same area where this study was conducted, also showed high prevalence of processes of consonant cluster simplification and simplification of final consonant in the children evaluated. These deviations are described as linguistic variation common to the region's population, since children were no longer in the process of acquiring these sounds²⁶. In Minas Gerais, the variation of consonant cluster simplification is frequently observed in adults, which could be explained by the /r/ sound being the most difficult sound to be pronounced³⁹. Children have their parents and family as models of speech and tend to use words in the same way as their peers. Thus children who live with adults who have these characteristics are more likely to produce the same patterns of oral language than children who don't^{13,40}. However, we chose not to consider these deviations as linguistic variation because these children are still in the period of acquisition of these phonological processes.

■ CONCLUSION

The high prevalence of oral language disorders – phonetic/phonological deviations verified in this study points to the need for development of therapeutic and prevention actions for children of the age group studied. For this to happen, it is essential that there is good communication between teachers and health professionals. By being in constant contact with children, educators are often able to identify children with speech difficulties and can stimulate them.

Other important associations observed were associations between auditory processing disorders and orofacial motor skills impairments with oral language deviations. The methodology does not allow the establishment of temporal or causal relationship between these variables. For this reason, greater attention to children whose development of these skills is found short than expected is mandatory.

The accumulation of oral language disorders at the age of four to five years suggests that this is a good stage for the identification and prevention of these deviations. This age group is considered a milestone in the development of language, involving morphological, syntactic, semantic and pragmatic aspects, which are essential to the understanding and use of language features.

It is suggested that further studies both in this and in other areas of Belo Horizonte are held, to compare the results. It is believed that research to examine the factors associated with these changes may complement the results. Thus, it would be possible to determine what types of actions would be most beneficial to this population, facilitating the adoption of preventive measures of oral language disorders prior to the interference of these deviations in the learning process of children at school age. Ensuring the quality of life of these individuals should be the main goal of the professionals who deal with these children.

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RESUMO

Objetivo: estudar a prevalência de alterações da linguagem oral em crianças de quatro a seis anos e verificar sua associação com as variáveis idade, sexo, presença de alterações de motricidade orofacial e presença de alterações de processamento auditivo. **Métodos:** realizou-se avaliação da linguagem oral (teste de avaliação de linguagem ABFW – Fonologia), avaliação de motricidade orofacial e avaliação simplificada do processamento auditivo. Os dados foram armazenados em formato eletrônico para análise estatística. Para comparação de proporções foi empregado o Teste Qui-Quadrado e para comparação de médias foi empregada a análise de variância. Foi considerado valor de 5% ($p \leq 0,05$) como limiar de significância estatística. **Resultados:** foram avaliadas 242 crianças de 4 anos a 6 anos e 11 meses de idade. Observou-se prevalência de 36,0% ($n=87$) de alterações de linguagem oral, e associação com faixa etária com significância estatística ($p=0,009$). Verificou-se associação entre desvio fonológico e faixa etária ($p<0,001$); entre a presença de desvio fonético e alterações de motricidade orofacial ($p<0,001$) e presença de desvio fonológico e alterações do processamento auditivo ($p<0,001$). **Conclusão:** a alta prevalência de alterações verificada aponta para a necessidade de elaboração de ações em atenção primária à saúde, de maneira a prevenir o aparecimento destas alterações, melhorar o acesso à intervenção e possibilitar a prevenção de problemas escolares mais graves. A maior ocorrência de alterações da linguagem oral na faixa etária de quatro a cinco anos sugere que esta seja uma boa fase para identificação e prevenção destes desvios.

DESCRIPTORIOS: Fonoaudiologia; Saúde da Criança; Desenvolvimento Infantil; Atenção Primária à Saúde; Linguagem Infantil; Distúrbios da Fala

■ REFERENCES

- Ruben RJ. Redefining the survival of the fittest: communication disorders in the 21st century. *Laryngoscope*. 2000;110:241-5.
- Zorzi JL. Diferenciando Alterações da Fala e da Linguagem. In: Marchesan IQ. Fundamentos em Fonoaudiologia: Aspectos Clínicos da Motricidade Oral. Rio de Janeiro: Guanabara Koogan, 1998. p. 62.
- Goulart BNG, Chiari BM. Prevalência de desordens de fala em escolares e fatores associados. *Rev Saúde Pública*. 2007;1(5):726-31.
- Andrade CRF. Prevalência das desordens idiopáticas da fala e da linguagem em crianças de um a onze anos de idade. *Rev Saude Pública*. 1997;31(5):495-501.
- Piaget J. O raciocínio na criança. Rio de Janeiro: Record; 1967. 241p.
- Wadsworth BJ. Inteligência e Afetividade da Criança na Teoria de Piaget. São Paulo: Pioneira; 1997. 223p.
- Lowe RJ. Fonologia – avaliação e intervenção: aplicações na patologia da fala. Tradução: Domingues Mag. Porto Alegre: Artes Médicas; 1996.
- Hernandorena CLBM. Aquisição da fonologia do português: estabelecimento de padrões com base em traços distintivos. [Tese]. Porto Alegre (RS): Pontifícia Universidade Católica do Rio Grande do Sul; 1990.
- Lamprecht RR. Perfil da aquisição da fonologia do português. [Tese]. Porto Alegre (RS): Pontifícia Universidade Católica do Rio Grande do Sul, Instituto de Letras e Artes; 1990.
- Yavas M. Padrões na aquisição da fonologia do português. *Letras de Hoje*, Porto Alegre, 1988; v. 23, p.7-30.
- Wertzner HF. Aquisição da articulação: um estudo em crianças de três a sete anos. *Estud. psicol.* 1994;11(1,2):11-21.
- Mourão LF, Parlato EM, Silvério KCA, Altmann EBC, Chiari BM. Descrição da ocorrência dos fonemas da língua portuguesa em pré-escolares. *Pró-Fono Rev Atual Cient*. 1994;6(1):27-32.
- Ferrante C, Van Borsel J, Medeiros M. Aquisição fonológica de crianças de classe sócio econômica alta. *Rev CEFAC*. 2008;10(4):452-60.
- Prates LPCS, Martins VO. Distúrbios da fala e da linguagem na infância. *Rev Med Minas Gerais*. 2011;21(4 Supl 1):S54-S60.
- Silva EI, Lima EM, Silveira PCM. Ocorrência de desvios fonológicos em crianças de escolas públicas do município de Camaragibe. *Fono Atual*. 2003;6(25):4-12.
- Casarin MT. Estudo dos desvios de fala em pré-escolares de escolas públicas estaduais de Santa Maria- RS. 116f. [Dissertação]. Santa Maria

- (RS): Centro de Ciências da Saúde, Universidade Federal de Santa Maria; 2006.
17. Vitor MR, Cardoso-Martins C. Desenvolvimento fonológico de crianças pré-escolares da Região Noroeste de Belo Horizonte. *Psicologia em Revista*. 2007;13(2):383-98.
 18. Goulart BNG, Ferreira J. Teste de rastreamento de alterações de fala para crianças: Terdaf. *Pró-Fono R Atual Cient*. 2009;21(3):231-6.
 19. Wertzner HF. Fonologia (Parte A). In: Andrade CRF, Befi-Lopes DM, Fernandes FDM, Wertzner HF. Teste de Linguagem Infantil nas Áreas de Fonologia, Vocabulário, Fluência e Pragmática. São Paulo: Pró-Fono, 2000.
 20. Junqueira P. Avaliação Miofuncional. In: Marchesan IQ. Fundamentos em Fonoaudiologia: aspectos clínicos da motricidade oral. Rio de Janeiro: Guanabara Koogan, 2005. 2ª edição. p.19-27.
 21. Pereira LD. Processamento auditivo. Temas sobre desenvolvimento. 1993;2(11):7-14.
 22. Corona AP, Pereira LD, Ferrite S, Rossi AG. Memória seqüencial verbal de três e quatro sílabas em escolares. *Pró-Fono R Atual Cient*. 2005;17(1):27-36.
 23. Nacente V, França MP. Estudo de prevalência de alterações na aquisição fonológica em pré-escolares e escolares. *Rev Fonoaudiol Brasil*. 2005;3:11-4.
 24. Cavalheiro LG, Keske-Soares M. Prevalência do desvio fonológico em crianças de 4 a 6 anos de idade. *Pró-Fono R Atual Cient*. 2008;20:11-3.
 25. Machado AS. Verificação da ocorrência de ceceo em crianças entre 3 e 10 anos. [dissertação]: Universidade Veiga de Almeida, Rio de Janeiro; 2006. Available from: http://www.uva.br/cursos/mestrados/fono/verificacao_da_ocorr_de_ceceo.pdf
 26. Rabelo ATV, Alves CRL, Goulart LMHF, Friche AAL, Lemos SMA, Campos FR et al. Alterações de fala em escolares na cidade de Belo Horizonte. *J Soc Bras Fonoaudiol*. 2011;23(4):344-50.
 27. Marchesan IQ. Alterações de Fala de Origem Musculoesquelética. In: Ferreira LP, Befi-Lopes DM, Limongi SCO. Tratado de fonoaudiologia. São Paulo: Roca, 2004. p.292-303.
 28. Nunes DA, Payão LMC, Costa RCC. Desvios fonológicos na educação infantil. *Rev. CEFAC*. 2010;12(2):331-6.
 29. Patah LK, Takiuchi N. Prevalência das alterações fonológicas e uso dos processos fonológicos em escolares aos 7 anos. *Rev. CEFAC*. 2008;10(2):158-67.
 30. Farias SR, Ávila CRB, Vieira MM. Relação entre fala, tônus e praxia não-verbal do sistema estomatognático em pré-escolares. *Pró-Fono R Atual Cient*. 2006;18(3):267-76.
 31. Soares K, Blanco APF, Mota, HB. O desvio fonológico caracterizado por índices de substituição e omissão. *Rev Soc Bras Fonoaudiol*. 2004;9:10-8.
 32. Linassi LZ, Keske-Soares M, Mota HB. Habilidades de memória de trabalho e o grau de severidade do desvio fonológico. *Pró-Fono R Atual Cient*. 2005;17(3):383-92.
 33. Magalhães ATM, Paolucci JF, Ávila CRB. Estudo fonológico e da percepção auditiva de crianças com ensurdecimento de consoantes. *Fono Atual*. 2006;8(35):22-9.
 34. Attoni TM. Discriminação fonêmica, processamento auditivo e reflexo acústico em crianças com desenvolvimento de fala normal e desviante. [Dissertação]. Santa Maria (RS): Universidade Federal de Santa Maria, Centro de Ciências da Saúde; 2009.
 35. Caumo DTM, Ferreira MIDC. Relação entre desvios fonológicos e processamento auditivo. *Rev Soc Bras Fonoaudiol*. 2009;14(2):234-40.
 36. Frias JS, Forasti FNR, Carmona AS, Di Ninno CQMS. Relação entre ceceo anterior e crescimento craniofacial e hábitos de sucção não nutritiva em crianças de 3 a 7 anos. *Rev CEFAC*. 2004;6(2):177-83.
 37. Barbosa C, Vasquez S, Parada MA, Gonzalez JCV, Jackson C, Yanez ND et al. The relationship of bottle feeding and other sucking behaviors with speech disorder in Patagonian preschoolers. *BMC Pediatr*. 2009;9(66): [about 8 p.]. Available from: <http://www.biomedcentral.com/content/pdf/1471-2431-9-66.pdf>
 38. Tomé MC, Farias SR, Araújo SM, Schmitt BE. Ceceo interdental e alterações oclusais em crianças de 03 a 06 anos. *Pró-Fono R Atual Cient*. 2004;16(1):19-30.
 39. Wertzner HF, Pagan-Neves LO, CASTRO MM. Análise acústica e índice de estimulabilidade nos sons líquidos do português brasileiro. *Rev. CEFAC*. 2007;9(3):339-50.
 40. Friche CP. Fatores associados às alterações de linguagem oral em escolares de 6 a 10 anos de idade em Belo Horizonte. [Dissertação]. Belo Horizonte (MG): Universidade Federal de Minas Gerais; 2011.

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