Original Article

RELATION BETWEEN THE PRODUCTION OF THE PHONEME /ʃ/ IN COMPLEX ONSET AND THE STOMATOGNATHIC SYSTEM IN PRESCHOOL CHILDREN

RELAÇÃO ENTRE A PRODUÇÃO DO FONEMA /ʃ/ EM ONSET COMPLEXO E O SISTEMA ESTOMATOGNÁTICO EM PRÉ-ESCOLARES

Raphaela Barroso GUEDES-GRANZOTTI[1]; Caroline Oliveira dos SANTOS[2]; Kelly da SILVA[3]; Rodrigo DORNELAS[4]; Aline Cabral de Oliveira BARRETO[5]; Carla Patrícia Hernandez Alves Ribeiro CÉSAR[5]

1. Professor, Doutor, Campus de São Cristóvão/UFS, Aracaju, SE, Brasil; 2. Fonoaudióloga Clínica, Itabaiana, Sergipe, Brasil; 3. Professor, Doutor, Campus de Lagarto/UFS, Lagarto, SE, Brasil; 4. Professor, Doutor, UFRJ, Rio de Janeiro, RJ, Brasil; 5. Professor, PhD, Campus de Lagarto/UFS, Lagarto, Sergipe, Brasil

ABSTRACT: This work verified the relation between the production of the phoneme /ʃ/ in complex onset with the structure, the tone and the mobility of the stomatognathic system in preschool children. The study consisted of 73 preschool children of both sexes, aged between 5 years and 1 month and 5 years and 11 months divided into two groups, GC consisting of 36 children with a complete phonetic and phonological inventory and GCI by 37 Children who had not only acquired the phoneme /ʃ/ in complex onset. Data collection was performed using the Orofacial Myofunctional Evaluation - MBGR protocol. The data were tabulated and submitted to the Chi-Square exact test and Fisher's exact test, considering $p \leq 0.05$. About the stomatognathic system, we observed a difference between the groups only in the task of tongue vibration. No significant difference for tonicity of the lips, tongue and cheeks and mobility of phonoarticulatory organs. We're not identified difference comparing the results with the sex of the participants. Children who did not produce the phoneme /ʃ/ in complex onset presented greater difficulty in performing tongue vibration.

KEYWORDS: Speech Therapy. Language. Speech Disorders. Child Development. Stomatognathic System.

INTRODUCTION

Phonological development in children occurs gradually, non-linearly, with instabilities and with individual variations over time until all speech sounds are produced in an expected way according to the age group, with their sound system properly organized (BAIA; CORREIA, 2016), in Brazilian Portuguese, around the age of five (MEZZOMO; LUIZ, 2012).

Researchers have shown an interaction between cognitive, language and motor development of speech in order to associate them as co-emergent during child development (NIP; GREEN; MARX, 2011), since factors such as orofacial motor and sensibility influence the development of speech (NEVES, 2016), so that, facial oromotor experiences, from the first year of life, are facilitators for the development of praxical skills required for speech production (GREEN; WILSON, 2006), confirming that the maturation of speech motor processing and the phonological development are interrelated during the development period (WERTZNER; ALVES; RAMOS, 2008).

The production of speech sounds is the result of the coordinated movements of different structures and subsystems that work harmoniously together in a complex motor act. For the input, it is necessary the phonological representation, so that, the motor control system of the speech can be activated; while the output is a sequence of articulatory movements that enable the transfer of a linguistic message through an acoustic signal that can be interpreted by the listener (KENT, 2000). Therefore, understanding how each articulator (tongue, lips and soft palate, for example) moves and positions itself for the production of the specific sounds of a given language has been the target of many studies for decades, with an increase in the advancement of biotechnology (WITHAN et al., 2015).

Due to the complexity of the acquisition of speech sounds, it is natural for children to use strategies called phonological processes during their development, in order to simplify the production of certain sounds. However, some children continue to present these changes beyond the expected age or present deviant processes, which are not expected in the typical development (WERTZNER; ALVES; RAMOS, 2008).

Researches (ÁVILA; VIEIRA, 2006, MARINI et al., 2011, GUBIANI; KESKE-SOARES, 2014, GUBIANI; CARLI; KESKE-SOARES, 2015, FARIAS; CERON et al., 2017) have identified a number of factors that may directly

Received: 12/05/18
Accepted: 15/10/18

influence the production of speech sounds, as well as in the severity of their disorders, such as the inability to organize the phonological rules of the language, difficulties in orofacial praxical skills, dentofacial deformities, oral breathing, changes in the tone of phonoarticulatory organs and imprecision of articulatory points. Thus, justifying the high prevalence of phonological disorders during childhood development.

Within this context, the phoneme / ʃ / in complex onset (when the phoneme / ʃ / is preceded by another consonant, that is, the "r" of the consonant groups) is one of the last sounds to be acquired in the course of speech development and may be influenced by sociocultural factors (QUEIROGA et al., 2015). Despite this, few studies specifically relate their production to the functional and structural aspects of the stomatognathic system.

This aspect deserves research in order to provide scientific evidence for the practice in clinical practice and the use of preventive strategies to minimize speech disorders in childhood. It is hypothesized that the functional aspects of the stomatognathic system, especially the language mobility, may interfere in the production of the phoneme / ʃ / in simple and complex onset, justifying the present investigation.

Thus, the objective of this study was to verify the relationship between the production of the phoneme / ʃ / in complex onset with the structure, tone and mobility of the stomatognathic system.

MATERIAL AND METHODS

Type of study and characterization of the sample

This is an observational, cross-sectional and descriptive study conducted in Brazilian and Sergipe pre-school children.

From a total of 212 children from institutions of early childhood education in the countryside of the state of Sergipe – who were invited to participate in the study and whose parents signed the TCLE –, 73 preschoolers, of both sexes and aged between five years and one month and five years and eleven months old.

Study Design

The participants were divided, after speech evaluation and auditory function screening, into two groups: *control* (CG) - children with typical acquisition of the phonological system and *study* (SG) - preschoolers with speech disorder that had not acquired the phoneme / ʃ / in complex onset. Children with alterations in the external or middle ear, with evidence of intellectual or neurological deficiency and other changes in the production of speech sounds were excluded. Were included children whose parents authorized the research, passing the hearing screening, demonstrating to understand speech, which presented expressive language without alterations regarding the lexicon and syntax, and monolingual speakers of Brazilian Portuguese.

In order to meet the exclusion and group composition criteria of both groups, all preschool children underwent hearing screening, speech and stomatognathic evaluation, as described below. The data were collected in the school environment, in a quiet room without distractors.

Screening of auditory function: a meatoscopy was performed to inspect the external auditory meatus to identify possible alterations that would impede hearing screening. For immitance measurement, the Interacoustics immitanciometer ZA 235 was used, with a 226 Hz probe tone. The acoustic reflex was searched ipsilaterally and contralaterally for frequencies of 500, 1000, 2000 and 4000 Hz. It was considered that the child "passed" in this evaluative stage when presented tympanometric curve of type A and presence of acoustic reflex in all the frequencies.

Speech evaluation: the MBGR Protocol speech assessment item (GENARO *et al*., 2009) was used, through the naming test of figures that were presented in boards with 21.0cm x 29.7cm, with colored images. The correctness and errors were considered, that is, the phoneme productions according to the pattern of the phonological system of the adult speaker of Brazilian Portuguese. The errors consisted of omission, substitution or distortion of the target phoneme of the study. All the evaluations were filmed on a Sony Cyber Shot digital video camera (7.2 megapixels), model DSC P200 and submitted for the analysis of two speech therapist judges, PhD professors, being a specialist in Language and a specialist in Orofacial Motricity. The production of speech sounds was analyzed dichotomically (normal and altered), being considered the phonological processes whose percentages of occurrence were greater than 25%. Agreement between the judges was analyzed according to Kappa statistics (COHEN, 1960), with the following force of agreement: if less than zero, it was considered poor; from zero to 0.2 - negligible force; between 0.21 and 0.4 - mild; between 0.41 and 0.6 - moderate and between 0.61 and 0.8 - substantial and, between 0.81 and one, - almost perfect (LANDIS; KOCH, 1977).

Intraoral examination: it was performed using a flashlight and a spatula to check the

occlusion. Were observed the anteroposterior relationship of the deciduous molars, the relationship of the deciduous canines and the horizontal (top bite, protruding and anterior crossbite), vertical (top bite, overbite, open anterior and posterior bite), transversal (right or left posterior crossbite) and midline deviations (right or left) occlusal alterations. For the inspection of teeth and occlusion, students from the Dentistry Undergraduate Course participated, under the supervision of a PhD and orthodontist professor.

Evaluation of lips and cheeks tone and tongue tension: performed by palpation and classified as: normal, increased or decreased.

Evaluation of the mobility of phonoarticulatory organs: a verbal request was made and, in the case of difficulty of understanding or accomplishment of the movement, a model was offered and imitation of the movement was requested. For the lips, tongue, cheeks and muscle palate, the movements were classified as: normal, with difficulties (either with approximate movement or performed by attempts) or does not perform; and for jaw: normal, performs with deviations (right or left) or does not perform.

Thus, the CG consisted of 36 children and the SG was composed by 37 children.

Data Analysis

The data was tabulated in an Excel spreadsheet software (Microsoft® Office package) for descriptive analysis of data and processed by SPSS® 16.0 for Windows. The Chi-Square and the Fisher's exact tests were used, and for the ordinal variables, the Mann Whitney test was used, considering the significance level of 5% ($p \leq 0.05$).

Ethical Considerations

The research was approved by the Research in Ethics Committee of the institution of origin (CAAE 14504313.3.0000.5546) and the guardians signed the Free and Informed Consent Term (TCLE) following all the guidelines of Resolution no. 466/2012 of the National Health Council.

All the children who presented alterations in the screening were referred to the Clinic-School of Speech, Language and Hearing Sciences at the University responsible for the research, after feedback to the parents / guardians.

RESULTS

A total of 39 (53.4%) male children (20 from CG and 19 from SG) and 34 (46.6%) female (16 from CG and 18 from SG), with mean age of five years and three months old (SD ± 3.8 months), participated in the study. No statistically significant differences were found in the distribution between the groups and the sex of the participants.

The findings of the structural evaluation of the stomatognathic system were adequate for most children in both groups, as can be seen in Table 1, as well as the comparison of the results of the evaluation among the groups studied, with a possible analysis, since the results revealed satisfactory kappa force among the judges' results, with k = 0.63 - considered as a substantial force.

Table 1. Comparison of the results of the structural evaluation of the phonoarticulatory organs between the groups studied.

Analyzed Items	Control Group			Study Group			p-value
Dental preservation	Good	Regular	Bad	Good	Regular	Bad	0,05
	20(55,6%)	12(33,3%)	4(11,1%)	21(56,7%)	10(27,1%)	6(16,2%)	
Gingival preservation	Good	Regular	Bad	Good	Regular	Bad	0,05
	34(94,4%)	1(2,8%)	1(2,8%)	35(94,6%)	2(5,40%)	0(0%)	
Dental midline	Adequate	Deviations (right or left)		Adequate	Deviations (right or left)		0,05
	26(72,2%)	10(27,8%)		31(83,8%)	6(16,2%)		
Occlusion	Normal	Altered		Normal	Altered		0,05
	27(75%)	9(25%)		28(75,7%)	9(24,3%)		
Horizontal alteration	Absent	Present (Top Bite, Anterior Crossbite, or Protruding)		Absent	Present (Top Bite, Anterior Crossbite, or Protruding)		0,05
	30(86,3%)	16(16,7%)		29(78,4%)	8(21,6%)		

Vertical alteration	Absent	Present (Top Bite, open anterior, posterior or overbite)	Absent	Present (Top Bite, open anterior, posterior or overbite)	0,05
	24(66,7%)	12(33,3%)	31(83,8%)	6(16,2%)	
Transversal alteration	Absent	Present (Right or Left Posterior crossbite)	Absent	Present (Right or Left Posterior crossbite)	0,05
	35(97,2%)	11(2,8%)	33(89,2%)	4(10,8%)	

Subtitle: P-value, considered as statistically significant when <or = 0.05, according to Chi-square and Fisher's exact tests.

In the evaluation of the mobility of structures of the stomatognathic system, presented in Table 2, there was a statistically significant difference between the groups regarding the ability of tongue vibration, and children with phonological disorders had a higher percentage of difficulties in vibrating the tongue than those with typical development.

Table 2. Comparison of the results of the mobility of the phonoarticulatory organs between the studied groups.

Analyzed Items / Requested Movements		Control Group			Study Group			p-value
		Normal Movement	Difficult movement	Does not perform	Normal	Difficult movement	Does not perform	
Lips	**Closed Protract**	35(97,2%)	1(2,8%)	0(0%)	33(89,2%)	4(10,8%)	0(0%)	>0,05
	Closed Retract	32(88,9%)	4(11,2%)	0(0%)	34(91,8%)	3(8,1%)	0(0%)	>0,05
	Closed Alternate protract / retract	31(86,1%)	5(13,9%)	0(0%)	30(81,1%)	7(18,9%)	0(0%)	>0,05
	Protracted snap	33(91,7%)	3(8,3%)	0(0%)	32(86,5%)	5(13,5%)	0(0%)	>0,05
Tongue	**Protract**	36(100%)	0(0%)	0(0%)	37(100%)	0(0%)	0(0%)	**
	Alternate protract / retract	35(97,2%)	1(2,8%)	0(0%)	35(94,6%)	2(5,4%)	0(0%)	>0,05
	Internally touch the cheek R	33(91,7%)	3(8,3%)	0(0%)	37(100%)	0(0%)	0(0%)	>0,05
	Internally touch the cheek L	33(91,7%)	3(8,3%)	0(0%)	37(100%)	0(0%)	0(0%)	>0,05
	Alternate touching the cheeks	33(91,7%)	3(8,3%)	0(0%)	37(100%)	0(0%)	0(0%)	>0,05
	Snap the apex	34(94,4%)	2(5,6%)	0(0%)	33(89,2%)	4(10,8%)	0(0%)	>0,05
	Vibrate	26(72,2%)	5(13,9%)	5(13,9%)	16(43,2%)	17(45,9%)	4(10,8%)	**<0,05***
Cheeks	**Inflate**	36(100%)	0(0%)	0(0%)	34(91,8%)	3(8,1%)	0(0%)	>0,05
	Inflate the R side.	33(91,7%)	3(8,3%)	0(0%)	30(81,1%)	7(18,9%)	0(0%)	>0,05
	Inflate the L side	32(88,9%)	4(11,2%)	0(0%)	31(83,8%)	6(16,2%)	0(0%)	>0,05

	Inflate Alternating the R and L sides.	31(86,1%)	5(13,9%)	0(0%)	26(70,3%)	11(29,7%)	0(0%)	>0,05
		Control Group			**Study Group**			
Palatine veil	**Speak repeatedly**	**Normal Motion**	**Reduced movement**		**Normal**	**Reduced movement**	**Absent movement**	>0,05
		33(91,7%)	1(2,8%)		31(83,8%)	5(13,5%)	1(2,7%)	
	Mouth opening	**Normal Movement**	**Movement with deviations (right or left)**		**Normal**	**Movement with deviations (right or left)**	**Does not perform**	
		35(97,2%)	1(2,8%)		37(100%)	0(0%)	0(0%)	>0,05
Jaw	**Mouth closing**	36(100%)	0(0%)		37(100%)	0(0%)	0(0%)	**
	Laterality to the right	36(100%)	0(0%)		36(97,3%)	0(0%)	1(2,7%)	>0,05
	Laterality to the left	36(100%)	0(0%)		36(97,3%)	0(0%)	1(2,7%)	>0,05

Subtitles: R = Right L = Left; * * represents values that are statistically significant according to the Chi-square test. ** p-value not computed because the variable is a constant.

Table 3 presents the findings of the evaluation of the tonus of stomatognathic system structures, showing statistically significant difference only in left cheek tone (augmented) in children with typical phonological development.

Table 3. Comparison of the tonicity results of the phonoarticulatory organs between the groups studied (Control and Study Groups)

	Control Group			**Study Group**			**p-value**
	Normal	**Increased**	**Decreased**	**Normal**	**Increased**	**Decreased**	
Upper Lip	35(97,22%)	1(2,77%)	0(0%)	34(91,80%)	2(5,40%)	1(2,70%)	>0,05
Inferior Lip	35(97,22%)	1(2,77%)	0(0%)	32(86,48%)	4(10,81%)	1(2,70%)	>0,05
Tongue	33(91,66%)	2(5,55%)	1(2,77%)	33(89,18%)	2(5,40%)	2(5,40%)	>0,05
Left Cheek	30(83,33%)	4(11,11%)	2(5,55%)	36(97,29%)	1(2,70%)	0(0%)	>0,05
Right Cheek	32(88,88%)	3(8,33%)	1(2,77%)	35(94,59%)	2(5,40%)	0(0%)	>0,05

Subtitle: P-value according to Chi-square test.

DISCUSSION

Brazilian epidemiological studies (HERNANDORENA; LAMPRECHT, 1997, SILVA et al., 2012, RODRIGUES et al., 2015) analyzed the phonological child development reporting that the acquisition of liquid non-lateral /ɾ/ is the latest, being first acquired in simple onset and then in complex onset. However, the studies differ in relation to the age of acquisition, since research carried out in Rio de Janeiro (SILVA; FERRANTE; BORSEL, 2012) and in Porto Alegre (HERNANDORENA; LAMPRECHT, 1997) evidenced effective acquisition in complex onset up to five years, and, in studies performed in Belo Horizonte (RODRIGUES et al., 2015) and São Paulo (ANDRADE et al., 2004), at the age of six. In addition, because there are no epidemiological studies that analyze children's phonological development of the complex onset in children in the northeastern region of Brazil, it was decided to use the age of five years for this sample. It should be noted, however, that Queiroga et al. (2015) obtained the process of simplification of the consonantal

meeting in the studied sample, whose Recife preschoolers presented a maximum age of six years and eleven months OLD, prompting the need for further studies in the northeastern region of Brazil.

Of the children evaluated in this study, 50.7% presented phonological deviation, a percentage similar to that observed in Canoas, Santa Catarina (INDRUSIAK; ROCKENBACH, 2012), where the incidence was 55%. However, the prevalence can be considered high when compared to other national studies in which the researchers found the presence of phonological disorder in 9.17% of the investigated children in Bahia (CAVALHEIRO; BRANCALIONI; KESKE-SOARES, 2012); 10% in a study conducted in the city of Porto Alegre (NACENTE, FRANÇA, 2005) and 15.26% in a study carried out in the city of Santa Maria (BRAGANÇA; LEMOS; ALVES, 2011), both in Rio Grande do Sul. The differences found in these studies can be justified by the fact that the studies differ in the method used, the age, the total number of individuals in the sample and the Brazilian region of the study - which may interfere in a greater or lesser percentage of occurrence of phonological deviation.

The later acquisition of the non-lateral liquid / ɾ / in complex onset is considered the last stage of the child's phonological acquisition (SILVA; FERRANTE; BORSEL, 2012), because it is a more complex production and requires more developed acoustic and articulation skills than in a simple syllable, in addition to coordinated and refined abilities of dissociated and simultaneous language movements (BARBERENA; KESKE-SOARES; BERTI, 2014).

This study did not verify the relationship between the tonicity of the lips, tongue and cheeks, as well as the structure and mobility of most phonoarticulatory organs with the production of the phoneme / ɾ / in complex onset, agreeing with a study that adopted a similar method (MARINI *et al*., 2011). The present study states that there is no relation between the changes in the phonological system and the structures and functions of the stomatognathic system in children with phonological disorders, with the phonological deviation related only to their age. The exception was the tongue vibration movement, in which an association with the articulatory difficulty of the movement was observed, suggesting that this movement is important for the acquisition of the phoneme / ɾ / in complex onset. This finding partially agrees with a study by Gubiani and Keske-Soares (2014), who reported finding a relation between the production of the respective phoneme and the tongue vibration, but also found a relationship with other praxis such as whistling, contraction and lip vibration.

Gubiani; Carli and Keske-Soares (2015) analyzed the relation of the / ɾ / to the stomatognathic system, only in simple onset, noting a significant difference only in the praxis of vibrating the tongue, suggesting that such praxis is a difficult skill to perform, in general, by children with phonological disorders. Fonseca; Dornelles; Ramos (2003) and Gonçalves; Ferreira, (2006) also evidenced that the movement of tongue vibration was difficult to be performed in the group of children without the phoneme / ɾ / established. Castro and Wertzner (2006) stated that the praxis of vibrating the tongue is only properly executed after the acquisition of the phoneme / ɾ / in the child's phonological system. The results of our study did not corroborate this assertion, since children of the CG who pronounced correctly the / ɾ / in complex onset also presented difficulties in vibrating the tongue, but in a smaller percentage than the SG.

The fact that only the ability to vibrate the tongue differed in the two groups, being more difficult for the children with phonological deviation, can indicate that the tongue is the main structure of the stomatognathic system involved in the production of the phoneme / ɾ /. Another aspect to be emphasized concerns the perception by the child of the acoustic characteristics of this sound, since he / she usually replaces it with another sound already acquired in his / her phonological inventory, such as the / l /. Thus, according to Miranda and Silva (2015), regarding the auditory perception of the existence of a sound that, however, cannot be pronounced, the child can make the substitution by another liquid consonant or, still, prolong the vowel, using compensatory strategies until it is possible to produce the phoneme / ɾ / in complex onset by means of oromotor routines. Toni (2017) commented that there are different strategies for children, in the acquisition phases, to try to emit complex onset, such as metathesis (transposition of the liquid consonant in the word, that is, instead of the expected Consonant (Occlusive) - Consonant (Liquid) Vowel - CCV, there may be the production of CVC or VCV); epenthesis (addition of a vowel among the consonants - CVCV); transposition (when the consonantal encounter occurs, but in another syllable of the word and not in the expected one), substitution (when the sound is changed by another) or erasure (the omission of the sound or even of the syllable in the word). Therefore, we hypothesized that one of the reasons why children with a simplified phonological disorder with

replacement or eradication of liquids did not advance in the non-lateral liquid acquisition / ʃ / in complex onset, in the studied group, occurs due to difficulty in vibrating the tongue. One of the limitations of the study was the size of the sample that did not allow a detailed analysis of all the strategies cited by Toni (2017).

The results, however, are discordant to most studies (WERTZNER; ALVES; RAMOS, 2008, SOUZA; AVILA, 2011, NAMASIVAYAM *et al*., 2013, GUBIANI; KESKE-SOARES, 2014 and GUBIANI; CARLI; KESKE-SOARES, 2015) that reported that children with phonological disorders have more changes in the stomatognathic system and in orofacial praxical skills than those with typical phonological development, since the only association found in this study was related to tongue vibration. However, we agree with the assertion of those authors who consider that speech requires a complex coordination with planning of lip and tongue movements for the production of speech sounds.

A single relationship between phonological deviation and difficulty in vibrating the tongue, in this research, may be related to the age range of the children evaluated, all of them older than five years old, with situation in which there is a greater neurophysiological maturation resulting from the development itself. This fact is not found in younger children evaluated in other studies, which may have influenced the findings. It would be interesting, therefore, to provide a longitudinal follow-up of the preschoolers in this study, in order to verify if the acquisition of the phoneme / ʃ / in complex onset would improve the vibration of the tongue or vice versa - being another limitation of this study, which had tranversal analysis perspective of the data.

A fact that should be highlighted refers specifically to the predominance of normal occlusion in both groups, which allows to infer that the incorrect production of the / ʃ / phoneme was not related to malocclusion, reinforcing the idea that the phonological deviation, in this group, is also due to a change in the phonological level, since there is no structural impairment that prevents the correct production of the sounds of language.

The limitations of the study focus on the lack of incorporation of other evaluative procedures that could facilitate the understanding of the difficulties of phonoarticulatory production of / ʃ / in the complex onset of the studied group. For example, tests of phonological awareness and simplified auditory processing test, as well as the difficulty of analyzing the position of this sound in test words, since the instrument used privileged the consonant-vowel position in the initial position of words.

As observed, there are few and non-conclusive studies on the subject regarding the influence or not of the phonoarticulatory praxis in the phonological deviations, being necessary a greater number of research considering other variables that can bring more information and that can subsidize an evidence-based clinical practice scientific research. This happens because the changes in the production of the phoneme / ʃ / in complex onset are common in the phonoaudiological clinic and the appropriate proposition of intervention measures will allow a better prognosis against the phonological deviations. Therefore, it is important to evaluate the myofunctional orofacial aspects, especially the evaluation of tongue tip vibration, in subjects with the presence of liquid simplification - in the case of the / ʃ / in complex onset, for the proposition of therapeutic strategies that may also include this work's objective.

CONCLUSION

The results showed an association between the production of the phoneme / ʃ / in complex onset and the tongue vibration. However, no association was found between the tonus of lips, tongue and cheeks; the mobility of the lips (protract closed, retract closed, alternate protract / retract closed, snap), of the tongue (protract, alternate protract / retract, internally touch the cheeks, snap the apex), of the cheeks (to inflate and to alternate right and left), of the muscular palate and of the jaw (opening, closing and laterality); as well as occlusion.

RESUMO: Este estudo objetivou verificar a relação entre a produção do fonema /ʃ/ em onset complexo com a estrutura, o tônus e a mobilidade do sistema estomatognático em pré-escolares. Participaram do estudo 73 pré-escolares, de ambos os sexos, com idades entre 5 anos e 1 mês e 5 anos e 11 meses divididos em dois grupos, sendo grupo controle constituído por 36 crianças com inventário fonético e fonológico completo e o estudo por 37 crianças que não haviam adquirido apenas o fonema /ʃ/ em onset complexo. Para a avaliação miofuncional orofacial foi utilizado o protocolo MBGR. Os dados foram tabulados e submetidos ao teste exato de Fisher e Mann Whitney, considerando-se p≤0,05. Com relação ao sistema estomatognático, observou-se diferença entre os grupos apenas na tarefa de vibração de língua. Não

foram identificadas associações significativas ao se comparar os resultados com a tonicidade dos lábios, língua e bochechas e demais movimentos solicitados dos órgãos fonoarticulatórios. Não foram identificadas diferenças entre o sexo e os resultados encontrados. Assim, as crianças que não produziram o fonema /ɾ/ em onset complexo apresentaram maior dificuldade em realizar vibração de língua.

PALAVRAS-CHAVE: Fonoaudiologia. Linguagem. Distúrbios da fala. Desenvolvimento Infantil. Sistema Estomatognático.

REFERENCES

ANDRADE, C. R. F.; BÉFI-LOPES, D. M.; FERNANDES, F. D. M.; WERTZNER, H. F. **ABFW**: teste de linguagem infantil nas áreas de fonologia, vocabulário, fluência e pragmática. Carapicuíba: Pró-Fono, 2004.

BAIA, M. D. F.; CORREIA, S. A auto-organização na emergência da fonologia: templates na aquisição do português brasileiro e europeu. **ReVEL**, Porto Alegre, v. 14, n. 27, p. 53-79, 2016.
BARBERENA, L. S.; KESKE-SOARES, M.; BERTI, L. C. Descrição dos gestos articulatórios envolvidos na produção dos sons /r/ e /l/. **Audiol Commun Res**., São Paulo, v. 19, n. 4, p. 338-344, 2014.

BRAGANÇA, L. L. C.; LEMOS, M. A.; ALVES, C. R. L. Caracterização da fala de crianças de 4 a 6 anos de creches públicas. **Rev CEFAC**, São Paulo, v. 13, n. 6, p. 986-992, 2011. https://doi.org/10.1590/S1516-18462011005000053

CASTRO, M. M.; WERTZNER, H. F. Estimulabilidade e tipos de erro de fala. **Rev soc bras fonoaudiol**., São Paulo, v. 11, n. 1, p. 1-9, 2006.

CAVALHEIRO, L. G.; BRANCALIONI, A. R.; KESKE-SOARES, M. Prevalência do desvio fonológico em crianças da cidade de Salvador, Bahia. **Rev Soc Bras Fonoaudiol**., São Paulo, v. 17, n. 4, p. 441-446, 2012.

CERON, M. I.; GUBIANI, M. B.; OLIVEIRA, C. R.; GUBIANI, M. B.; KESKE-SOARES, M. Ocorrência do desvio fonológico e de processos fonológicos em aquisição fonológica típica e atípica. **CoDAS**, São Paulo; v. 29, n. 3, p. e20150306, 2017. https://doi.org/10.1590/2317-1782/20172015306

COHEN, J. A coefficient of agreement for nominal scale. **Educ Psychol Measurement**, v. 20, p. 37-46, 1960. https://doi.org/10.1177/001316446002000104

FARIAS, S. R.; ÁVILA, C. R. B.; VIEIRA, M. M. Relação entre fala, tônus e práxis não-verbal do sistema estomatognático em pré-escolares. **Pró-Fono Rev de Atual Cient**, São Paulo, v. 18, n. 3, p. 267-276, 2006. https://doi.org/10.1590/S0104-56872006000300006

FONSECA, R. P.; DORNELLES, S.; RAMOS, A. P. Relação entre a produção do r-fraco e as praxias linguais na infância. **Pró-Fono Rev de Atual Cient**., São Paulo, v. 15, n. 3, p. 229-240, 2003.

GENARO, K. F.; BERRETIN-FELIX, G.; REHDER, M. I. B. C.; MARCHESAN, I. Q. Avaliação miofuncional orofacial – protocolo MBGR. **Rev CEFAC**, São Paulo, v. 11, n. 2, p. 237-255, 2009. https://doi.org/10.1590/S1516-18462009000200009

GONÇALVES, C. S.; FERREIRA, M. C. Estudo da relação entre presença de frênulo lingual curto e/ou anteriorização e a dorsalização do fone /r/ na articulação da fala. **Rev CEFAC**, São Paulo, v. 8, n. 1, p. 56-60, 2006.

GREEN, J. R.; WILSON, E. M. Spontaneous facial motility in infancy: a 3D kinematic analysis. **Dev. Psychobiol.**, New York, v. 48, n. 1, p. 16-28, 2006.

GUBIANI, M. B.; CARLI, C. M.; KESKE-SOARES, M. Desvio fonológico e alterações práxicas orofaciais e do sistema estomatognático. **Rev CEFAC**, São Paulo, v. 17, n. 1, p. 134-142, 2015. https://doi.org/10.1590/1982-0216201517513

GUBIANI, M. B.; KESKE-SOARES, M. Evolução fonológica de crianças com desvio fonológico submetidas a diferentes abordagens terapêuticas. **Rev CEFAC**, São Paulo, v. 16, n. 2, p. 663-671, 2014. https://doi.org/10.1590/S1516-18462012005000071

HERNANDORENA, C. M.; LAMPRECHT, R. A. Aquisição das consoantes líquidas do português. **Let Hoje**, local, v. 32, n. 4, p. 7-22, 1997.

INDRUSIAK, C. S.; ROCKENBACH, S. P. Prevalência de desvio fonológico em crianças de 4 a 6 anos de escolas municipais de educação infantil de Canoas-RS. **Rev CEFAC**, São Paulo, v. 14, n. 5, p. 943-951, 2012. https://doi.org/10.1590/S1516-18462012005000011

KENT, R. D. Research on speech motor control and its disorders: a review and prospective. **J commun disord**., Amsterdam, v. 33, n. 5, p. 391-427, 2000.

LANDIS, J.; KOCH, G. The measurement of observer agreement for categorical data. **Biometrics**, Washington, v. 33, n. 1, p. 159-174, 1977. https://doi.org/10.2307/2529310

LEWIS, B. A.; FREEBAIRN, L. A.; HANSEN, A. J.; STEIN, C. M.; SHRIBERG, L. D.; IYENGAR, S. K.; et al. Dimensions of early speech sound disorders: a factor analytic study. **J commun disord**., Amsterdam, v. 39, n. 2, p. 139-157, 2006.

MARINI, C.; BRANCALIONI, A. R.; GUBIANI, M. B.; FREITAS, G. P.; KESKE-SOARES, M.; CECHELLA, C. O fonema /r/ e as alterações do sistema estomatognático, idade, gênero e gravidade no desvio fonológico. **Rev soc bras fonoaudiol**., São Paulo, v. 16, n. 4, p. 422-429, 2011.

MEZZOMO, C. L.; LUIZ, S. W. Interferência da variante linguística nas estratégias de reparo utilizadas no processo de aquisição fonológica. **J. soc. bras. fonoaudiol**., São Paulo, v. 24, n. 3, p. 239-247, 2012.

MIRANDA, I. C.; SILVA, T. C. Aquisição de encontros consonantais tautossilábicos: uma abordagem multirrepresentacional. **Rev. Linguística,** Rio de Janeiro, v. 7, n. 1, p. 14-30, 2015.

NACENTE, V. P.; FRANÇA, M. P. Estudo da prevalência de alterações na aquisição fonológica em pré-escolares e escolares. **Rev**. **Fono Brasil**, Brasília, v. 3, n. 1, p. 1-4, 2005.

NAMASIVAYAM, A. K.; PUKONEN, M.; GOSHULAK, D.; YU, V. Y.; KADIS, D. S.; KROLL, R., et al. Relationship between speech motor control and speech intelligibility in children with speech sound disorders. **J commun dis**., Amsterdam, v. 46, n. 3, p. 264-280, 2013.

NEVES, M. **Motricidade orofacial e o desenvolvimento da articulação verbal**. 2016. 59f. Dissertação [Mestrado em Terapia da Fala], Escola Superior de Saúde do Alcoitão, Alcoitão, Portugal, 2016.

NIP, I. S.; GREEN, J. R.; MARX, D. B. The co-emergence of cognition, language, and speech motor control in early development: A longitudinal correlation study. **J commun dis**., Amsterdam, v. 44, n. 2, p. 149-160, 2011.
QUEIROGA, B. A. M.; ROSAL, A. G. C.; SILVA, A. C. F.; CORDEIRO, A. A. A. Análise dos processos fonológicos em crianças da região metropolitana do recife. **Rev. CEFAC**, São Paulo, v. 17, n. 5, p. 1449-1456, 2015 .

RODRIGUES, K. H. M.; DINIZ, N. L. F.; LEITE, R. C. D.; REZANDE, C. M.; MARTINS REIS, V. O. Aquisição da líquida não lateral por crianças de Belo Horizonte - Minas Gerais - Brasil. **Distúrb Comun**., São Paulo, v. 27, n. 4, p. 789-797, 2015.

SILVA, M. K.; FERRANTE, C.; BORSEL, J. V.; PEREIRA, M. M. B. Aquisição fonológica do Português Brasileiro em crianças do Rio de Janeiro. **J soc bras fonoaudiol**., São Paulo, v. 24, n. 3, p. 248-254, 2012.

SOUZA, T. N. U.; AVILA, C. R. B. Gravidade do transtorno fonológico, consciência fonológica e práxis articulatória em pré-escolares. **Rev. soc. bras. fonoaudiol**., São Paulo, v. 16, n. 2, p. 182-188, 2011.

STRAND, E. A.; MCCAULEY, R. J.; WEIGAND, S. D.; STOECKEL, R. E.; BAAS, B. S. A motor speech assessment for children with severe speech disorders: reliability and validity evidence. **J. speech lang. hear. res**., Rockville, v. 56, n. 2, p. 505-520, 2013.

TONI, A. Estratégias de reparo ao ataque ramificado CCV na aquisição fonológica. **Rev. Letras**, Curitiba, n. 96, p. 255-286, 2017.

WERTZNER, H. F.; ALVES, R. R.; RAMOS, A. C. O. Análise do desenvolvimento das habilidades diadococinéticas orais em crianças normais e com transtorno fonológico. **Rev soc bras fonoaudiol**., São Paulo, v. 13, n. 2, p. 136-142, 2008.