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POSTURE, LIPS AND TONGUE TONE AND MOBILITY OF MOUTH BREATHING CHILDREN

Postura, tônus e mobilidade de lábios e língua de crianças respiradoras orais

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ABSTRACT

Purpose: to characterize lips and tongue posture, tone and mobility of mouth breathing children. **Method:** the subjects of this study, conducted in São Paulo, SP, Brazil, were 40 mouth breathing children, 26 (65%) male and 14 (35%) female, aging between 7 and 10-year old. MBGR protocol was used to evaluate the aforementioned aspects. **Results**: the following results were obtained for lip posture: semi-open lips (32.5%), alternating between open and closed lips (27.5%), open lip posture (22.5%) and closed lips (17.5%). With regards to the upper lip tone: 90% showed normal muscle tone, 10% lower tone, and no subjects showed a higher muscle tone. As for the tone of the lower lip, 80.0% of the children showed lower muscle tone, and 20.0% normal muscle tone. For the lips mobility variable, 100% had their mobility close to the best scores. Regarding tongue posture, 57.5% had a low-lying resting tongue posture, 32.5% did not allow for observation of this variable, and in 10.0% of the subjects the tongue was placed in an interdental resting posture. As for tongue muscle tone, 52.5% showed lowered tone, and 47.5% were considered normal. When assessing tongue mobility, 100% had mobility close to the best scores. **Conclusion:** characteristics of posture, tone and mobility of lips in this study's mouth breathing children were: semi-opened lip posture, upper lip with normal tone, lower lip with lowered tonicity and normal mobility. Regarding tongue characteristics: low-lying resting posture, lowered muscle tone and normal mobility.

KEYWORDS: Evaluation; Tongue; Lips; Child; Mouth Breathing

INTRODUCTION

Predominantly nasal breathing is an essential function for the balanced growth and development of orofacial muscles. In order for nasal breathing to efficiently occur, there must be conditions that allow air passage through the nostrils. When breathing nasally is impossible, either due to obstruction or to habit, breathing will occur predominantly through the mouth.

The term predominant mouth breathing is used since the cases in which this exclusively oral

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respiratory mode occurs are rare. In many cases, the individual is able to breathe nasally, even with narrow passage through one of the nostrils [1].

When present, mouth breathing may be caused by obstruction of the upper airways, or by habit [2]. Many factors may lead to mouth breathing, such as anatomical issues, congenital malformations, inflammations, infections, tumors or systemic diseases [3]. However, there may be situations in which the individual breathes orally only as a habit, without having any real impediments in the upper airways.

Some characteristics are commonly found in mouth breathers, such as habitual semi-opened lips position, low-lying tongue position, hyperfunction of the mentual muscle during lip occlusion, eversion of the lower lip, cheek symmetry, possibility of lip occlusion, altered dental occlusion, and altered hard palate [4].

In addition to influencing craniofacial growth and development, the respiratory mode can generally influence children's behavior and learning in school [1].

Therefore, the mouth breathing child may present various disorders of orofacial muscles, among other issues. The purpose of this study was to characterize habitual posture, tone and mobility of the lips and tongue of mouth breathing children in between 7 and 10 years of age, of both sexes, using the Miofunctional Orofacial Exam protocol (MBGR) [5]. This instrument was chosen for the following reasons: systematization of assessment, and the possibility to quantify and compare the scores to the results of different studies.

METHOD

This is a quantitative, cross-sectional study. The subjects were 40 mouth breathing children, 26 males (65%) and 14 females (35%), in between 7 and 10 years of age. The children were distributed as follows according to age: 10 children were 7 years old, 10 were 8 years old, 10 were age 9, and 10 were aged 10. Only children under 10 took part in this study, due to the growth spurt, which generally happens in between ages 10 and 12 for females and 12 and 14 for males [6].

The following exclusion criteria were adopted: not having any form of mental, neurological and/or auditory disorder diagnosed by a doctor, which could compromise the understanding of the instructions given by the researcher during assessment. The children who had colds or the flu on the day of testing were also excluded.

The study was conducted at the CEFAC institute (http://www.cefac.br/), in the city of São Paulo, due to the great number of mouth breathing children assisted in the institution.

The mouth or mouth and nose breathing children in the studied age group were referred to the institute with previous diagnosis from the ear nose and throat (ENT) doctor, since there is an agreement between the CEFAC Institute and a local hospital to obtain certain medical evaluations and tests.

The specific data for this study was obtained using part of the MGBR protocol [5], administered in its entirety at the institution. The aspects analyzed in this study regarded posture, tone and mobility of lips and tongue, and it took, in average, 10 to 15 minutes per child to collect this data. Each assessment was performed by a Speech Language Pathologist at the Institute, who marked the results in a specific answer sheet at the time of testing, and registered the examination in videos and photographs. All assessments in this study were conducted by the same researcher.

Some of the items of the protocol were dependent only of the observation of the Speech Language Pathologist responsible for testing, such as lip and tongue posture, assessed during habitual rest posture. For the purpose of tone assessment, in addition to visual observation, the clinician also palpated the structures. To evaluate the mobility of the lips and tongue, the execution of each of the movements included in the protocol was requested verbally, three times. In the event of the child not understanding the instruction, a model of the requested movement was performed by the clinician. Since the aim of this test is to know whether or not there is a possibility to perform the specific movement, the fact that a model was or was not provided is not taken into account. The scores vary according to the performance of the requested movement: normal (0), approximate (1), tries to accomplish (2) and does not accomplish (3).

In accordance with the MBGR protocol [5] the following 12 tests were conducted to assess lip mobility: protrude and retract while closed, and alternate protruding/retracting while closed; protrude and retract while open, and alternate protruding/retracting while open; closed and protruded to the right (R), closed and protruded to the left (L) and alternate closed and protruding to the R and L; snap while protruded, snap while retracted, and alternate snapping while protruded and retracted. The best result for lip mobility was score zero, and the worst, score 36.

In regards to tongue mobility, the 17 tests were conducted, following the MBGR protocol [5]: alternating protruding/retracting; elevate to the incisive papilla; alteranting raising and lowering; alternating raising to the papilla and lowering; elevating to the

upper lip; elevate/lower touching the lips; touch the R lip commissure and then the L; alternate touching R and L lip commissures; use the tip to touch in sequence R/L commissures and the upper (U) and lower (LO) lips; touch the inside of the R and then L cheeks; alternate touching R and L cheeks; snap the tip; snap the body of the tongue; suck the tongue towards the palate; and vibrate. The best result for tongue mobility was 0 points, and the worst, 51 points.

The child remained seated on a chair, beside her parents, during the entire testing session. The clinician was positioned in front of the child. The materials used for test administration were: disposable gloves and wooden tongue depressors.

All parents and/or caregivers of the children/subjects of this study read and signed an informed consent term. This study was approved by the Research Ethic Committee of the Pontifical Catholic University of São Paulo, under protocol number 302/2008.

The obtained data were analyzed descriptively, through the analysis of the frequency distribution of the study's variables. Results were crossed and analyzed according to: sex and age; posture, tone and mobility of the lips and tongue.

RESULTS

The data from the assessment of 40 children between ages 7 and 10 were recorded, and the following results presented in Tables 1-4 were reached:

Table 1 presents the sample distribution, according to sex and age.

Table 2 presents a description of the studied sample, in regards to lip posture and tone. None of the children in this study remained with their lips closed with tension or closed with dental contact. For this reason these specific lip postures were not included in the table. In regard to lip tone, the upper and lower lip were assessed separately, and there was no child found to have an increased tone in either the upper or lower lip.

Table 1 – Number and percentage of individuals, according to sex and age

Sex	Age (in years)								Total	
	7		8		9		10			
	N	%	N	%	N	%	N	%	N	%
Male	9	22,5	6	15,0	6	15,0	5	12,5	26	65,0
Female	1	2,5	4	10,0	4	10,0	5	12,5	14	35,0
Total	**10**	**25,0**	**10**	**25,0**	**10**	**25,0**	**10**	**25,0**	**40**	**100,0**

Key: N= number of subjects

Table 2 – Number and percentage of individuals, according to habitual posture and tone of the lips

Variable	Description of evaluated aspect	N	%
Lip posture	Open	9	22,5
	Alternating open and closed	11	27,5
	Semi-opened	13	32,5
	Closed	7	17,5
Upper lip tone	Lowered	4	10,0
	Normal	36	90,0
Lower lip tone	Lowered	32	80,0
	Normal	8	20,0

Key: N= number of subjects

Table 3 shows data relative to the description of children assessed according to tongue posture and tone. In regard to tongue posture, of the 13 children (32,5%) in which the habitual position could not be observed, five had their lips semi-opened, five alternated between open and closed lips, and four had their lips closed. It was not possible to observe, in any of the children, if the tongue had a high dorsum. As far as tongue tone, none of the 40 children had increased tone.

Table 4 contains the scores that represent the results of mobility assessment of both lips and tongue. In regard to the lips, the children had score values closer to the best possible results, and no child scored higher than 10. When considering the tongue, the score values were also closer to the best results, and no child scored higher than 9.

Table 3 – Number and percentage of individuals, according to tongue posture and tone

Variable	Description of evaluated aspect	N	%
Tongue posture	Interdental	4	10,0
	Not observable	13	32,5
	Low-lying	23	57,5
Tongue tone	Lowered	21	52,5
	Normal	19	47,5

Key: N= number of subjects

Table 4 – Number and percentage of individuals, according to score values of mobility of the lips and tongue

Variable	Presented score values	N	%
Lip mobility (best result= 0 and worse= 36)	0	19	47,5
	1	3	7,5
	2	2	5,0
	3	6	15,0
	4	3	7,5
	5	3	7,5
	7	1	2,5
	8	2	5,0
	10	1	2,5
Tongue mobility (best result= 0 and worse= 51)	0	22	55,0
	1	2	5,0
	2	5	12,5
	3	2	5,0
	4	4	10,0
	5	1	2,5
	7	1	2,5
	8	1	2,5
	9	2	5,0

Key: N= number of subjects

DISCUSSION

Mouth breathing may bring consequences to orofacial muscles, occlusion, speech, mastication and voice [1-2,4,6-25]. However, it is known that the disorders observed in the mouth breathing individual may vary, and depend upon other factors aside from breathing. It is important to understand the combination of functions of the stomatognathic system, as well as their inter-relationships. For this reason, a mouth breathing child must undergo an assessment of all of the functions of the stomatognathic system [24].

The MBGR assessment protocol is designed to provide a complete evaluation [5]. The present study only contemplated aspects regarding habitual posture, tone and mobility of the lips and tongue, which may be altered in mouth breathers [7-13,17].

In regards to the studied sample, the number of boys was greater when compared to the number of girls, especially in the 7 year old age group. A sample with a greater number of mouth breathing boys was also present in other studies [9,11,26-29]. On the other hand, in another study, there was no difference between the number of male and female subjects [13]. Thus, it may not be affirmed that there is a prevalence of mouth breathing in boys in between 7 and 10 years of age, in spite of other studies as well as the present one having demonstrated this fact.

Some aspects about the respiratory mode of the studied subjects must be analyzed. Nine subjects (22,5%) had an open lip posture, and the rest were characterized as either semi-open, alternating between open and closed, or closed. For this reason, apparently only a minority of the sample was exclusively mouth breathing. The other children were oral-nasal breathers, which reflects alongside the fact discussed in the literature that highlights that exclusively mouth breathing children are rare, or occur in a minority when compared to oral-nasal breathers [1,13].

The mouth breathing child has difficulty in using her nose to breathe, due to having, in some cases, an impediment to use the nostrils to breathe [3]. Considering this fact, it would be expected that the lips of the subjects in the studied had remained open, semi-open, alternating between open and closed, in the case of oral-nasal breathers; and open, in case the child was an exclusive mouth breather. However, seven children (17,5%), previously diagnosed as being mouth breathers, remained with their lips closed during assessment. In this case, one may suppose that they were oral-nasal breathers, who had free upper airways on the day of testing. This allowed for exclusive nasal breathing, and maintenance of sealed lips.

Semi-open lip posture of mouth breathers was found in 13 subjects (32,5%), as in other studies [9,11-13]. This semi-open lip posture may be justified by the fact that there is less activity of the upper and lower orbicular muscles in mouth breathers, when compared to nasal breathers [7].

It may be that those who remained alternating between open and closed lips (27,5%) tried to keep their lips closed, but were unsuccessful to do so the entire time, due to this diminished muscle activity, to a possible nose obstruction factor, or to a possible unfavorable dental-skeletal condition.

In regards to lip tone, the importance of separately evaluating the upper and lower lips should not be underestimated since, in this study, sometimes opposite results were observed for each one.

According to researched literature, the upper lip in the mouth breather is usually retracted or short, thin, and hypofunctional [10,13]. These specific studies do not make it completely clear if the short and hypofunctional characteristics of the upper lip reflect in decreasing the tone. Hypofunction may be related to the fact that the upper orbicular muscle of mouth breather is less active [7]. In spite of this, 90% of the children in this study had normal upper lip tone, a finding that differs from the previously mentioned studies.

Concerning the lower lip, the majority of the subjects (80,0%) had low tone. A similar finding was reported by another study which, even though did not assess upper and lower lips separately, characterized the lips of mouth breathers as flaccid [12]. According to the literature, the lower lip of the mouth breather is interposed in between the lips [10], thick [11], hypotonic and dry [13], and everted [10-11]. This eversion may happen in consequence of lower tonicity (as found in this study), aspect which may be examined more efficiently through additional tests, such as a surface electromiography.

Regarding lip mobility, it is not possible to affirm that there is a relationship between this aspect and the tone of the lips. In this study, 100% of the sample has lip mobility close to the best possible results, in spite of the lower tonicity of the lips. Some authors [7] state that mouth breathers have hypofunctional lips, but it is not certain that this hypofunction is related to mobility, posture or tone, aspects which are interrelated. One study [9] reports lip disorders in mouth breathers, although it does not state which disorder was found. There is no reference in the researched literature which characterizes lips according to their mobility and/or conducted tests pertaining to the MBGR protocol for comparison of the findings of the present study.

Some authors [8,10] characterize the tongue posture of the mouth breather as anterior, or with

elevated dorsum, in an attempt to regularize the airflow. The findings in this study differed, showing that most of the participating children (57,5%) had low-lying tongue posture.

Mouth breathers' tongue tone is most commonly researched in Speech-Language Pathology, possibly because of its influence in orofacial functions and dental occlusion. It is commonly present in Angle's Class I or Class II type occlusions [19,22,23]. In this study, dental position was not evaluated, but lowered tongue tone was observed in the majority of the children (47,5%), as referred by some authors [11,12]. According to one study [17], axial forces of the tongues of mouth breathing children have lower values than those of nasal breathers.

All of the children participating in this research presented good tongue mobility, with close scores to the best possible results, according to the instrument used for assessment. Once again, it was verified that lowered tone does not necessarily impair mobility.

Even though the present study focused on aspects of the assessment of the mouth breather which were related to posture, tone and mobility of the lips and tongue, a thorough evaluation is imperative, focusing also on orofacial functions and aspects of development and learning which may be impaired. In addition, photography documentation, face measurements and, if possible, surface electromiography testing are suggested as integral parts of the assessment.

This study is based on the MBGR protocol. Conduction of further studies using this protocol with normal subjects, or with those with orofacial disorders is suggested, so that patterns of normality can be established, thus making this tool possible of being used as reference in Speech-Language Pathology diagnosis.

CONCLUSION

The posture, tone, and mobility characteristics of the lips of mouth breathing children were: semi-opened lips, upper lip with normal tone, lower lip with lowered tone, and normal mobility.

The aspects referring to tongue posture, tone and mobility in mouth breathing children were: low-lying tongue posture, lowered tone, and normal mobility.

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RESUMO

Objetivo: caracterizar a postura, o tônus e a mobilidade dos lábios e da língua de crianças respiradoras orais. **Método:** participaram do estudo realizado em São Paulo, SP, Brasil, 40 crianças respiradoras orais, sendo 26 (65%) do sexo masculino e 14 (35%) do sexo feminino, com idades entre 7 e 10 anos. Utilizou-se o protocolo MBGR para avaliação dos aspectos analisados. **Resultados**: foram encontrados os seguintes achados para postura dos lábios: entreabertos (32,5%), alternância entre abertos e fechados (27,5%), abertos (22,5%) e fechados (17,5%). Em relação ao tônus do lábio superior: 90% apresentaram tônus normal, 10% diminuído e nenhuma com tônus aumentado. Quanto ao tônus de lábio inferior, 80,0% das crianças apresentaram tônus diminuído e 20,0% normal. No item mobilidade dos lábios, 100,0% apresentaram mobilidade mais próxima dos melhores escores. Em relação à postura habitual da língua, em 57,5% esta estrutura permaneceu no assoalho, em 32,5% não foi possível observar sua posição e em 10,0% se encontrava em posição interdental. Quanto ao tônus da língua, 52,5% apresentaram tônus diminuído e 47,5% normal. Na avaliação de mobilidade de língua, 100,0% apresentaram mobilidade mais próxima dos melhores escores. **Conclusão:** as características de postura, tônus e mobilidade dos lábios das crianças respiradoras orais estudadas foram: lábios entreabertos, lábio superior com tônus normal, lábio inferior com tônus diminuído e mobilidade normal. Em relação à língua: postura no assoalho da boca, tônus diminuído e mobilidade normal.

DESCRITORES: Avaliação; Língua; Lábios; Criança; Respiração Bucal

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