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Ethnic influence of the lips and incisor in the diagnosis and orthodontic planning

Influência étnica dos lábios e incisivos no diagnóstico e planejamento ortodôntico

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Resumo

Introdução: A estética facial desempenha um papel fundamental no desenvolvimento psicossocial dos seres humanos. A análise dos tecidos moles é uma parte essencial do diagnóstico ortodôntico, planejamento de tratamento e acompanhamento, sendo que os lábios, o nariz e o queixo são estruturas importantes na composição facial. Contudo, a posição dos lábios é um fator de maior relevância, pois influencia diretamente a estética facial, a estabilidade dental e a oclusão. **Objetivo:** Avaliar a relação da projeção labial com a inclinação dos incisivos e o padrão facial esquelético em uma população brasileira mista. **Material e método:** Dados provenientes de prontuários ortodônticos de 100 pré-adolescentes de 7 a 9 anos de idade e de origem étnica mista parda. A amostra foi dividida em dois grupos com base na avaliação fotográfica do perfil facial das crianças considerando a posição dos lábios superior e inferior ao pogônio tegmental e região subnasal mediante concordância de três avaliadores. Grupo 1, protrusão normal dos lábios superiores e inferiores e Grupo 2, biprotrusão dos lábios superiores e inferiores. Cefalometria laterais foram utilizadas para avaliar a posição dos lábios, inclinação dos incisivos, padrão de crescimento facial e relação ântero-posterior maxilomandibular. A análise dos dados comparou as diferenças de gênero e grupo e a associação entre variáveis esqueléticas e dentárias com a posição labial. **Resultado:** A protrusão dos lábios superiores e inferiores apresentou correlação fraca, mas significativa, com o ângulo SNA e moderadamente significativa com o ângulo ANB. SNGoMe apresentou correlação fraca, significativa e positiva com a protrusão do lábio inferior para a linha B. IMPA e IS.SN apresentaram correlação fraca e significativa com a protrusão do lábio superior e inferior para ambas as linhas B e S. **Conclusão:** Não há evidências de diferença sexual na relação esquelética, dentária ou de tecidos moles de crianças brasileiras de 7 a 9 anos de idade de etnia parda. Entretanto, existe uma correlação significativa entre protrusão labial e protrusão maxilar, relação maxilomandibular, padrão de crescimento facial e inclinação dos incisivos superiores e inferiores.

Descritores: Lábios; ortodontia; cefalometria.

Abstract

Introduction: Facial esthetics plays a fundamental role in the psychosocial development of human beings. Soft tissue analysis is an essential part of orthodontic diagnosis, treatment planning, and follow-up, with the lips, nose, and chin being important structures in facial composition. However, the position of the lips is of greater relevance, as it directly influences facial aesthetics, dental stability, and occlusion.

Objective: To evaluate the relation of the lip projection with incisor inclination and skeletal facial pattern in a mixed Brazilian population. **Material and method:** Data derived from orthodontic records of 100 pre-adolescents 7 to 9 years of age and brown mixed ethnic origin. The sample was divided in two groups based on the photographic evaluation of the children´s facial profile considering the position of the upper and lower lips to the tegmental pogoniun and subnasal region by agreement of three evaluators. Group 1, normal protrusion of the upper and lower lips and Group 2, biprotrusion of the upper and lower lips. Lateral cephalograms were used to evaluate lip position, incisors inclination, facial growth pattern, and

maxillomandibular anteroposterior relationship. Data analysis compared gender and group differences and the association between skeletal and dental variables with the labial position. **Result:** Protrusion of the upper and lower lips showed a weak but significant correlation with SNA angle and a moderate significant correlation with ANB angle. SNGoMe presented a weak, significant, and positive correlation with the lower lip protrusion to line B. IMPA and IS.SN showed a significant weak correlation with upper and lower lips protrusion for both B and S lines. **Conclusion:** There is no evidence of sexual difference in the skeletal, dental, or soft tissue relationship of Brazilian children 7 to 9 years of age of brown ethnicity. However, there is a significant correlation between lips protrusion and maxillary protrusion, maxillomandibular relationship, facial growth pattern, and inclination of the upper and lower incisors.

Descriptors: Lips; orthodontics; cephalometry.

INTRODUCTION

Facial esthetics is an important factor for the psychosocial development of human beings. A pleasing appearance contributes to a favorable social perception, conveying a more friendly, intelligent, and positive sense of image than people with a less pleasant appearance. Children and their parents, as well as adults, seek improvements in facial appearance and smile through orthodontic treatment, with the expectation that the outcome will provide a better quality of life[1].

Soft tissue analysis is part of the process of orthodontic diagnosis, treatment planning and treatment follow up. Lips, nose, and chin are important structures in facial composition, but the position of the lips has a greater weight, as it influences facial aesthetics, dental stability, and occlusion. The position of the lips can be evaluated by several reference lines and normative cephalometric values are created based on specific populations since previous studies show that adaptation of soft tissues to skeletal discrepancies varies between different races and populations[2-4].

The Orthodontic treatment can improve facial appearance by establishing a more harmonious profile. The repositioning of the incisors affects the position of the lips and their sagittal relationship[5,6]. These results are more significant when the treatment involves the extraction of premolars and subsequent retraction of the incisors[7].

The assessment of the cephalometric discrepancy proposed by Tweed is commonly used in orthodontic planning to the present day. The method determines the correct inclination of the lower incisors relative to the mandibular plane and provides the difference between the original position of the lower incisors and their ideal position. However, in clinical practice, using as a parameter only the dental position to perform orthodontic movements, often does not favor, or even impairs, facial aesthetics.

Normative cephalometric values should be based on studies performed for specific populations, as they can influence diagnosis, treatment plan, and orthodontic outcome. The evaluation of lip position has become an important analysis because it has a great impact on facial aesthetics, occlusion, and dental stability. Some researchers have reported that there are differences in soft tissue characteristics between distinct ethnic groups, indicating that the adaptation of soft tissue to the adjacent skeletal tissue varies according to the population[3].

The Brazilian Institute of Geography and Statistics (IBGE) classifies the Brazilian population based on five different types of races: whites, blacks, browns (or “pardos” in portuguese), yellows and indigenous people. The brown race makes up 43.42% of the Brazilian population based on information obtained from the 2010 Demographic Census[8].

Thus, the objective of this study was to evaluate the facial profile in relation to the position of the incisors, inclination of the mandibular plane and anteroposterior maxillomandibular relationship in the Brazilian population of brown mixed ethnic. In addition, this study intends to evaluate possible sexual dimorphism in the studied variables. The findings of this study may provide important information for the diagnosis and planning of orthodontic treatment.

MATERIAL AND METHOD

The sample derived from orthodontic diagnostic documentation of 100 pre-adolescents, 7- to 9-year-old (50 males and 50 females) of brown mixed ethnic origin enrolled for Preventive Orthodontics treatment in a Scholl of Dentistry from 2010 to 2018. They were in the mixed dentition phase with at least two erupted upper and lower permanent incisors, presence of first permanent molars and normal protrusion or mild retrusion of the mandible. The sample represents about 2,56% of the 5 to 9 years-old brown children of the region according to estimation based in the IBGE 2010-year demographic informs.

The pre-adolescent patients were divided into 2 groups. Three previously calibrated evaluators performed the sample selection based on the subjective evaluation of facial profile photography, mandibular sagittal positioning in relation to the middle and upper face, and lips projections. The selected children should have a straight facial profile or convex profile and good mandibular positioning or slight mandibular retrusion. Regarding the lip projection, the selected children should have normal position or protrusion of the lips in relation to the tegument pogoniun and subnasal region, to contemplate two groups:

Group 1: 50 children (25 male and 25 females, 8.3 ± 0,6 years old) with normal lip protrusion (mild projection of the upper and lower lips in relation to the soft tissue pogoniun and subnasale region, visually evaluated in facial profile photography) (Figure 1).

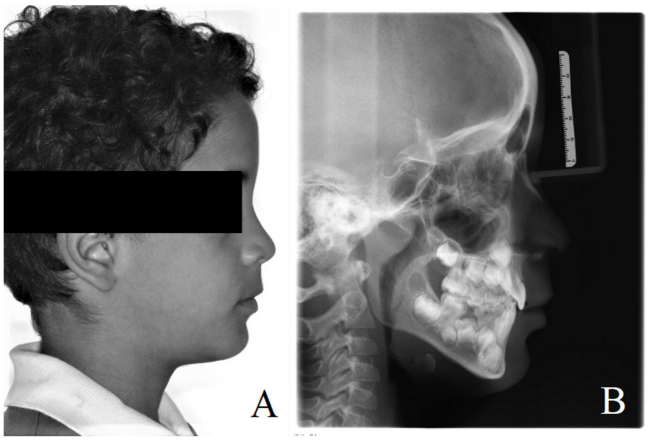

Figure 1. A-Lateral photograph, B-teleradiograph of a patient from Group 1 (normal lip position).

Group 2: 50 children (25 male and 25 females, 8.5 ± 0,6 years old) with lip biprotrusion (severe projection of the upper and lower lips in relation to the soft tissue pogoniun and subnasale region, visually evaluated in facial profile photography) (Figure 2).

White, black, yellow, and indigenous children and children with growth syndromes or abnormalities, extreme facial deviations or asymmetries were excluded from the sample as well as children with premature loss of permanent or deciduous teeth.

Diagnostic lateral teleradiographs of the children were used for the cephalometric study. The radiographs were taken with teeth in maximum intercuspation, head position oriented by the Camper's plane, with relaxed tissues and passive lip seal.

Seventeen cephalometric landmarks were identified and digitalized by a single operator, who was blinded in respect to patients, using the Radiocef Studio V.1 R.3 software. Angular and linear values of lip position, incisor inclinations, facial growth pattern, and maxillomandibular anteroposterior relationship were measured (Figure 3). The same operator performed repeated measurements after two weeks to calculate intra-examiner error.

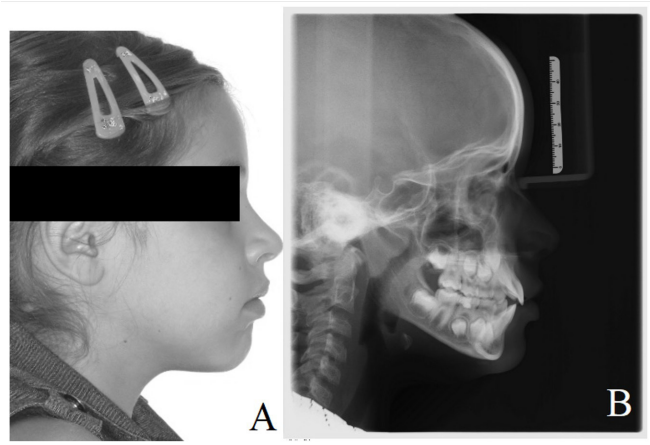

Figure 2. A- Lateral photograph, B- Teleradiograph of a patient from Group 2 (lip biprotrusion).

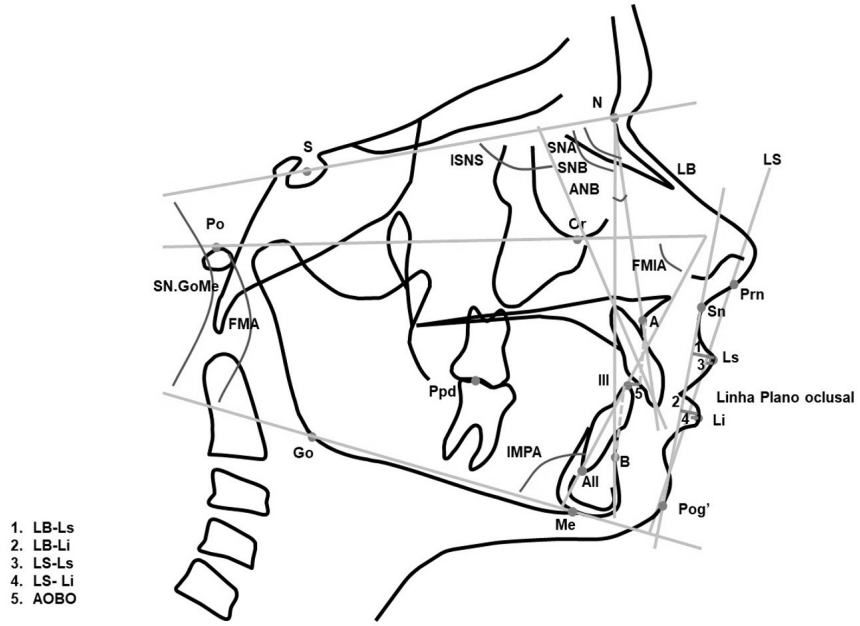

Figure 3. Cephalometric analysis (Table 1). Skeletal and dental landmarks: S (sella, geometric center of the sella turcica; N (nasion, most anterior point of the frontonasal suture); A (subespinhal, most deep point of the alveolar convexity of maxilla) B (most deep point of the alveolar convexity of mandible) (supramentonian); Go (gonion, most antero-inferior point of mandible); Me (menton, most inferior point of the mandibular symphysis); Po (anatomical porion, most superior point of the anatomical porion); Or (Orbital, most inferior point of the orbital contour); III (incisal border of the lower incisor); AIi (apex of lower incisor); IIS (incisal border of the upper incisor); AIS (apex of the upper incisor); Ppd (medial point between the mesial cuspid of the upper and lower first molars).Soft tissue landmarks: Prn (nasal columella, mid of the nasal curve), Sn (union between nasal base and upper lip), Ls (most protruded point of the upper lip), Li (most protruded point of the lower lip), Pog' (most protruted point of the soft tissue pogoniun). Angular mesaurements: SNA, SNB, ANB, SNGoMe, FMA and IMPA. Linear measurements: AOBO (Witts), LB-Ls (Burstone's line (Sn-Pog')-Labrale Superius, LB-Li (Burstone's line (Sn-Pog')-Labrale Inferius, LS-Ls (Steiner'line (Prn-Pog')-Labrale Superius), LS-Li (Steiner's line (Prn-Pog')-Labrale Inferius).

Statistical analysis

Statistical analysis was performed using the SPSS program, (version 16, SPSS, Chicago) with a significance level of 5%. We estimated a power of 0.99 for two-tailed *t*-test for two independent samples, with n = 50 per group and a probability of 0.05, using lower lip position (LB-Li) mean

values of 3.8 mm (SD 1.8 mm) in group 1 and 5.6 mm (SD 1.7 mm) in group 2 or upper lip position (LB-Ls) mean values of 5.0 mm (SD 1.5 mm) in group 1 and 6.6 mm (SD 1.7 mm) in group 2.

Measurement error was evaluated using the Intraclass Correlation Coefficient (ICC). Sex differences for each variable were analyzed using Student's t-test. Pearson's correlation was performed to evaluate the correlation between soft tissue and the other variables. Cohen[9] in 1988 proposed that r values between 0.10 and 0.29 indicate a weak correlation, from 0.30 to 0.50, a moderate correlation, and from 0.50 to 1, a strong correlation.

In addition, the sample was divided according to the anteroposterior and vertical skeletal malocclusion, and the mean and standard deviation of lip protrusion based on two reference lines were calculated for each subgroup. The ANB angle was used to classify patient skeletal relationship into class I (ANB from 0 ° to 4 °), class II (ANB greater than 4 °), and class III (ANB less than 0 °). The SNGoMe angle was used to classify patients in mesofacial pattern (SNGoMe from 28 ° to 36 °), dolichofacial pattern (SNGoMe higher than 36 °), and brachyfacial pattern (SNGoMe lower than 28 °). The ANS angle was used to classify maxillary sagittal position in maxillary protrusion (ANS greater than 84 °), normal maxilla position (ANS from 80 ° to 84 °), and maxillary retrusion (ANS less than 80 °).

RESULT

The repeated measures analysis of the variables showed that the lower limit of the 95% confidence interval for ICC was greater than 0.937 and the overall ICC value for the study was 0.963.

The sample was obtained to contemplate two groups with the same number of children of both sexes. The groups presented, on average, normal maxillary position (SNA within normal values) and mandibular retrusion (SNB decreased), with mean ANB and AOBO within normal for the age group. The growth pattern of the children evaluated by SNGoMe was considered dolichofacial as a function of their mean value increased. According to IMPA, in the G1 group, the lower and upper incisors had normal inclination and in the G2 group the lower incisors showed increased vestibular inclination (Table 1).

Table 1. Characteristics of the sample according to the groups, sex difference (males x females) and group difference

	Group 1 n=50		Sex diference			Group 2 n=50		Sex diference			Group diference		
Variable	**Mean**	**SD**	**Mean**	**SE**	**p**	**Mean**	**SD**	**Mean**	**SE**	**p**	**Mean**	**SE**	**p**
SNA	80.7	3.7	-0.7	1.1	0.522	81.7	4.1	-0.8	1.2	0.48	-1.0	0.8	0.224
SNB	76.5	3.5	-0.6	1.0	0.551	77.3	3.7	-0.5	1.1	0.64	-0.8	0.7	0.269
ANB	4.2	2.0	-0.1	0.6	0.883	4.4	1.7	-0.3	0.5	0.48	-0.2	0.4	0.645
AOBO	-0.2	2.5	0.4	0.7	0.600	-0.6	3.1	0.1	0.9	0.96	0.4	0.6	0.476
SNGoMe	38.1	4.8	0.0	1.4	0.993	38.0	4.8	-0.5	1.4	0.71	0.1	1.0	0.955
FMA	28.8	4.2	-0.6	1.2	0.643	29.4	4.6	-1.4	1.3	0.30	-0.4	0.9	0.613
IMPA	92.2	6.7	0.2	1.9	0.905	96.1	6.5	-1.0	1.9	0.60	-3.9	1.3	0.004**
ISNS	105.6	7.4	0.6	2.1	0.762	107.5	7.6	-1.5	2.2	0.49	-1.9	1.5	0.218
LB- Ls	5.0	1.5	0.8	0.4	0.072	6.6	1.7	0.7	0.5	0.15	-1.6	0.3	0.000**
LB- Li	3.8	1.8	0.9	0.5	0.070	5.7	1.7	-0.1	0.5	0.91	-1.9	0.3	0.000**
LS-Ls	1.6	1.7	0.8	0.5	0.098	2.9	1.9	0.8	0.5	0.15	-1.3	0.4	0.000**
LS- Li	1.7	1.9	1.0	0.5	0.063	3.6	1.8	-0.1	0.5	0.87	-1.9	0.4	0.000**

SD (standard deviation). SE (standard error). p (probability). **Correlation is significant at the 0.01 level.

No sexual dimorphism was found for the study variables in the comparison between boys and girls (Table 1). The comparison between the groups also showed no significant differences for the

skeletal measurements (Table 1), indicating that the children of both groups had homogeneous skeletal facial patterns. Reflecting the characteristics used for the division of the groups, significant differences were observed in the measurements of the soft tissue profile in relation to the B-line (Sn-Pog ') and the S-line (Prn-Pog'), with larger values for Group 2 indicating greater upper and lower lip protrusions. In addition, there was a greater vestibular inclination of the lower incisor (greater IMPA) in Group 2. On the other hand, no group difference was observed for the inclination of the upper incisor (1SSN).

Pearson's correlation results (Table 2) showed a weak but significant correlation between the upper and lower lip protrusion and the SNA angle and a moderate significant correlation between upper and lower lip protrusion and ANB angle. The inclination of the mandibular plane in relation to the cranial base (SNGoMe), presented a weak, significant, and positive correlation with the lower lip protrusion evaluated through line B (LB_Li). The axial inclination of the lower incisors (IMPA) and the axial inclination of the upper incisors (IS.SN) presented a weak significant correlation with the protrusion of the upper and lower lips based on the two reference lines B and S (LB-LS, LB-Li, LS-Ls, and LS-Li.

Table 2. Pearson's correlation for the evaluated variables

		LB-Ls	LB-Li	LS-Ls	L S-Li
SNA	r	0.29	0.2	0.26	0.21
	p	0.18	0.627	0.363	0.694
ANB	r	0.35	0.34	0.38	0.36
	p	0.000**	0.001**	0.000**	0.000**
AOBO	r	-0.03	0.01	-0.02	0.02
	p	0.761	0.904	0.872	0.834
SNGoMe	r	0.11	0.2	0.13	0.19
	p	0.262	0.046*	0.189	0.057
FMA	r	0.08	0.15	0.07	0.13
	p	0.44	0.132	0.499	0.194
IMPA	r	0.27	0.27	0.25	0.28
	p	0.006**	0.006**	0.014*	0.004**
IS.SN	r	0.24	0.12	0.24	0.15
	p	0.015*	0.247	0.015*	0.128

r(correlation). p (probability). **Correlation is significant at the 0.01 level. *Correlation is significant at the 0.05 level.

The subgroup analysis considering skeletal malocclusion showed that the average upper and lower lip projection, Class II, and dolichofacial pattern of children with maxillary protrusion are greater than in other types of malocclusions (Table 3).

Table 3. Lip projection according to facial patterns

		LB-Ls		LB-Li		LS-Ls		LS-Li	
Facial pattern	%	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Retruded maxilla	36	5.4	1.9	4.5	1.9	1.7	1.9	2.3	2.0
Class I	47	5.2	1.6	3.9	1.8	1.5	1.7	1.7	1.9
Class II	53	6.3	1.7	5.3	1.8	2.8	1.9	3.4	2.0
Dolichofacial	63	6.0	1.8	5.0	1.9	2.5	2.0	3.0	2.0
Mesofacial	34	5.4	1.7	4.2	2.1	1.8	1.8	2.1	2.2

DISCUSSION

This study has a cross-sectional and observational design to evaluate the correlation between anterior teeth inclinations, facial growth patterns, and maxillomandibular anteroposterior relations with the upper and lower lip position.

The age range of the pre-adolescents was restricted as much as possible to avoid interference of craniofacial growth in the intended analysis. Previous studies on skeletal changes due to growth show that skeletal measures such as SNA, ANB, and SNGoMe decrease over time, whereas SNB measures tend to increase. Bishara et al.[10] evaluated soft tissue changes, including upper and lower lip ratio with the Ricketts esthetic line in patients between 5 and 45 years of age and reported similar changes in direction and magnitude in men and women, but earlier in women than in men. Regarding lip protrusion, the results showed that from the age of 5, the upper and lower lips become progressively more retruded. Therefore, orthodontists must be aware when planning the treatment of young patients, since later changes in lip protrusion that will occur might affect or even impair the soft tissue profile at the end of treatment.

The sample selection included only children of brown ethnicity which were 43,4% of the total population of Brazil according to the 2010 census representing the ethnic diversity and miscegenation of the Brazilian population allowing the estimation of normative cephalometric values for diagnosis, treatment planning and evaluation of orthodontic results. The evaluation of lip position has become an important analysis because it has a great impact on facial aesthetics, occlusion, and dental stability. Some researchers have reported that there are differences in soft tissue characteristics between distinct ethnic groups, indicating that the adaptation of soft tissue to the adjacent skeletal tissue varies according to the population[3].

The two reference lines used in the present study to assess the lip position were Steiner's S line (Prn-Pog') and Burstone's B line (Sn-Pog'). These lines were selected based on Hsu[2] who reported that the Burstone's line may play a great role in the study of the lateral facial soft profile because it presents excellent consistency (lower coefficient of variation) and sensitivity (power to differentiate attractive facial profiles from non-attractive ones). Their study also showed that the nose should be considered when a line is used for esthetic analysis of the lateral facial profile, since it is highly consistent. Murthy et al.[4] did not find a significant difference in lip sagittal position when using the lines of Burstone (B line), Steiner (S1 line), Sushner (S2 line), Rickets (E line), and Holdaway (H line).

Correlation studies

1. Correlation of lip position with anteroposterior maxillomandibular relationship and anterior teeth inclination (Table 2).

The maxillary protrusion degree (SNA) showed a weak, significant, and positive correlation with the upper and lower lips position using the two lines used, indicating that the greater the maxillary protrusion, the more protruded are the lips. This is reflected in the anteroposterior relationship between maxilla and mandible (ANB), which presented a moderate positive correlation with the two lines used, indicating that the higher the anteroposterior value between maxilla and mandible, the greater the protrusion of the lips. On the other hand, the degree of mandibular protrusion (SNB) and the maxillomandibular relationship in the antero-posterior direction (AOBO) showed no significant correlation with the upper and lower lips.

These results corroborate data from another study that investigated the sagittal position of the lip in different malocclusions and showed that individuals who presented skeletal class II, evaluated by ANB measurement, had the upper and lower lips more protruded when compared to skeletal class I and class III[4].

The lower incisors axial inclination relative to the bone base (IMPA) showed a weak and positive correlation with the upper and lower lips using the two reference lines, indicating that the greater vestibular position of the lower incisors, the more protruding the lips. The axial inclination of the upper incisors relative to the base of the skull (1.NS) showed a weak and positive correlation with the upper lips in the two reference lines, indicating that the higher the buccal position of the upper incisors, the greater the protrusion. Recent study[11] showed similar result, that there is a correlation between upper lip morphology and proclination of anterior teeth.

Landázuri et al.[12] showed that Class II patients treated with the Balter's Bionator functional appliance, exhibited a maxillary growth restriction without significant change of the SNB angle when compared to equivalent control group and a decrease of 4,5° in the upper incisor inclination and decrease of 0,8 mm in the upper lip protrusion using the E reference line (tip of the nose to tegument pogonion). On the other hand, Class II control group showed stability of the upper incisor inclination and upper lip protrusion after 14,6 months of evaluation in a sample of children of 8 to 10 years of age.

Premolar extractions may contribute with the change in incisor inclination. Ramos et al.[5] reported that after extraction of premolars and subsequent retraction of anterior teeth, horizontal changes from the most anterior point of the upper incisor showed a significant correlation with horizontal changes in the upper and lower lips. In addition, significant correlations were found between horizontal changes of the inferior labial sulcus and the cervical point and incisal edge of the lower incisors. Despite significant correlations, care should be taken with individual predictions, since lip thickness may influence this correlation; lip retraction was less pronounced in patients with thicker lips than in those with thinner lips. Positive correlations between upper and lower incisor retraction and upper and lower lip movement, upper and lower lip thickness, nasolabial angle, and height of the lower third of the face were also reported by Sodagar et al.[13]. The authors reported a ratio of 2:1 between upper incisor and upper lip movement and concluded that there is a strong positive correlation between incisor retraction and lips retraction.

2. Correlation of lips with facial growth pattern (Table 2)

The mandibular plane inclination in relation to the cranial base (SNGoMe) showed a weak and significant correlation with the lower lip measured by the B line (LB-Li), indicating that the more vertical the growth pattern, the smaller the lip protrusion. On the other hand, the mandibular plane inclination in relation to the mid third of the face (FMA) showed no significant correlation with the upper and lower lips position measured by both lines, LB and LS.

Contini et al.[14] reported a positive correlation between the lower incisor position and the alteration of the soft tissue profile but did not find a significant difference when comparing patients with different growth patterns. Lai et al.[15] concluded that it is not reliable to determine the lips relationship with the movement of the incisors in different facial patterns. Those authors evaluated changes in soft tissue after orthodontic treatment in patients with long and short facial types according to the position of the upper incisor and facial pattern (protrusion with long face, retrusion with long face, protrusion with short face, and retrusion with short face) finding great variability of the soft tissue in response to the teeth movement.

The analysis of the skeletal characteristics of the sample in the anteroposterior and vertical directions, showed that 45% of the patients had normal maxillary position, followed by 36% maxillary retrusion and 19% of maxillary protrusion. The mean upper and lower lip projection (based on the two lines LB and LS) was higher for the group with maxillary protrusion and progressively smaller in children with normal maxillary position and maxillary retrusion (Table 3).

No participants could be classified as Class III, 53% was Class II, and 47% was Class I. The mean upper and lower lip projection using the two reference lines LB and LS, was higher for the skeletal Class II group.

Only three participants were classified as having a brachyfacial growth pattern, so the brachyfacial classification was not considered in the analysis. Most of the sample (63%) was

classified as having the dolichofacial pattern followed by 34% with the mesofacial pattern. The mean upper and lower lip projection (using the two reference lines LB and LS) was greater for the group with dolichofacial growth pattern.

The standard value for the upper lip based on the Burst line is 3.5 ± 1.4 mm and for the lower lip 2.2 ± 1.6 mm. For the Steiner line, the lips should touch the reference line. In all the facial patterns, the average values of lip projection were above the norm, indicating overall lip protrusion in our sample (Table 3).

In 1970, Peck, Peck[16] studied the soft tissue profile of beauty contest winners over the years. The great difference observed over the years was that the pattern of female beauty changed from a straight lip profile to a fuller lip profile. These results agree with more recent studies, which point for prominent lips to be more accept as esthetic standards. Values for the group with normal lip protrusion showed this trend, verified by the greater lip protrusion than the normative values of Burstone and Steiner

The values obtained for the normal projection of the group were about 1.5 mm larger than the normative values proposed by Burstone and Steiner and in the biprotrusion group both lips were protruded almost double the normative value. Based on these results, it is recommended that for the diagnosis and planning of the treatment of Brazilian pre-adolescents, the values of LB-Ls = 5.0 ± 1.5 and LB-Li = 3.8 ± 1.8 as standards for the Burstone and LS-Ls analysis = 1.6 ± 1.7 and LS-Li = 1.7 ± 1.9 as standards for Steiner's analysis (Table 3).

CONCLUSION

Brazilian children 7-to-9-year-old of brown ethnicity showed no sexual difference in the skeletal, dental, or soft tissue relationship. However, they showed a significant correlation between upper and lower lips protrusion and the following cephalometric factors: maxillary protrusion, maxillomandibular relationship, facial growth pattern, and upper and lower incisor inclination.

AUTHORS' CONTRIBUTIONS

Ana Thais Bagatini: Made substantial contributions to analysis and interpretation of data; Involved in drafting the manuscript revising it critically for important intellectual content; and give final approval of the version to be published.

Jaqueline Trento Negrão Tebaldi: Made substantial contributions to conception and design, acquisition of data, analysis and interpretation of data; Involved in drafting the manuscript revising it critically for important intellectual content; and give final approval of the version to be published.

Nicole Tonin Iplinsky: Made substantial contributions to conception and design, acquisition of data, analysis and interpretation of data; Involved in drafting the manuscript revising it critically for important intellectual content; and give final approval of the version to be published.

Suellen Tayenne Pedrosa Pinto: Made substantial contributions to acquisition of data and involved in drafting the manuscript revising it critically for important intellectual content.

Ary Santos-Pinto: Made substantial contributions to conception and design, acquisition of data, analysis and interpretation of data; Involved in drafting the manuscript revising it critically for important intellectual content; and give final approval of the version to be published.

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CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest related to this study.

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