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Original articles

Anthropometric orofacial measurements of children according to facial type

Medidas antropométricas orofaciais de crianças segundo o tipo facial

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ABSTRACT

Purpose: assess anthropometric orofacial measurements of boys and girls according to facial type.

Methods: participants were 126 children, 64 girls and 62 boys, aged between seven and 11 years. Anthropometric orofacial measurements were compared between the facial types obtained by cephalometric analysis. Initially, a descriptive analysis of facial types was conducted based on sex. Anthropometric measurements in boys and girls were compared separately by analysis of variance, followed by sex-independent analysis. Data were analyzed considering a significance level of 5%.

Results: a larger number of brachyfacial individuals were found in the sample, followed by mesofacial and dolichofacial subjects. Comparison of facial measurements for the three types showed a significant difference in the lower third of the face among boys, and in face height, lower third and lower lip among girls. When anthropometric measurements were compared independently of sex, a significant difference was observed in the lower third, right and left sides of the face, as well as the upper and lower lips.

Conclusion: as expected, analyses of all the results, considering sex or not, found lower anthropometric orofacial measurements in brachyfacial individuals, which was most evident in measurements related to the lower vertical plane.

Keywords: Anthropometry; Face; Measurements; Children

RESUMO

Objetivo: avaliar as medidas antropométricas orofaciais segundo o tipo facial de crianças do sexo masculino e feminino.

Métodos: participaram do estudo 126 crianças, 64 do sexo feminino e 62 do sexo masculino, com idade entre sete anos e 11 anos. As medidas antropométricas orofaciais foram comparadas entre os tipos faciais obtidos por meio da análise cefalométrica. Inicialmente foi realizada análise descritiva dos tipos faciais de acordo com os sexos. Por meio da Análise de Variância, foi realizada a comparação das medidas antropométricas no sexo masculino e feminino isoladamente e, posteriormente, foi realizada a análise independe do sexo. Os dados foram analisados considerando nível de significância de 5%.

Resultados: encontrou-se um número maior de braquifaciais, seguidos de mesofaciais e dolicofaciais na totalidade da amostra. Na comparação das medidas antropométricas entre os três tipos faciais, evidenciou-se no sexo masculino diferença significante na medida de terço facial inferior e no sexo feminino, nas medidas da altura facial, terço inferior e lábio inferior. Quando comparadas as medidas antropométricas de forma independente do sexo, evidenciou-se diferença significante no terço inferior, lados direito e esquerdo da face, lábios superior e inferior.

Conclusão: como esperado, nas análises de todos os resultados, considerando ou não os sexos, as medidas antropométricas orofaciais foram menores nos braquifaciais, com maior evidência encontrada nas medidas relacionadas ao plano vertical inferior.

Descritores: Antropometria; Face; Medidas; Criança

INTRODUCTION

The human face consists of muscular and bony structures that vary according to the facial type of the individual. In general, the face is classified as short or brachyfacial, medium or mesofacial, and long or dolichofacial[1]. Each type has its own characteristics, evident in the orofacial musculature, shape of the craniofacial structures, shape of the dental arches and occlusion[1,2]. These features can directly influence functions such as chewing, swallowing, breathing and speech. Due to the close relationship with stomatognathic functions, it is important to consider facial types during diagnosis and treatment in the field of orofacial myology[1].

The brachyfacial type exhibits greater horizontal growth, whereas horizontal and vertical growth factors are balanced in mesofacial individuals and vertical growth predominates in dolichofacial types[3]. The use of cephalometry is recommended in the literature for the classification of facial types [4,5]. Cephalometric analysis enables the study of dentofacial structures and craniofacial growth and is frequently used in the field of orthodontics[4].

In speech-language pathology, anthropometric orofacial assessment is performed in the clinical practice of orofacial myology to quantitatively assess the morphology of the orofacial complex[5]. Its simplicity, low cost and the absence of risk to the individual have made it an important clinical tool, providing reference data for a variety of orofacial measurements[6].

Given the specificities of each facial type and the importance of anthropometry in quantifying the morphological characteristics of the craniofacial complex, this study aimed to evaluate orofacial anthropometric measurements in boys and girls according to facial type.

METHODS

This is an analytical cross-sectional study, approved by the institutional Research Ethics Committee under protocol number 08105512.0000.5346. The children agreed to participate in the study and written informed consent was given by their parents or legal guardians.

Participants were Brazilian children aged between seven and 11 years and 11 months. Those who had a history of speech and language and/or orthodontic treatment, noticeable signs of neurological impairment and/or syndromes and craniofacial malformations were excluded. Based on these criteria, the sample consisted of 126 children, 64 girls (average age of 9.15 years) and 62 boys (average age of 8.83 years). The study was conducted at four public schools in the municipality of Santa Maria, in Rio Grande do Sul state.

Anthropometric assessment was performed by a speech-language pathologist and measurements were obtained directly from the children's faces using a Digimess Pro-Fono digital caliper. Facial width (zy-zy) was measured using an adapted 8.25 centimeter-long metal extension on the tip of the device for external measurement[7].

During anthropometric assessment the children remained seated, facing the examiner, with their feet on the ground, head in a neutral position, mouth closed and teeth in centric occlusion without clenching[5,6,8].

To obtain orofacial measurements, the craniofacial points were palpated to ascertain the precise locations, which were indicated with a dermographic pencil. Anthropometric measurements were taken without pressing the tips of the digital caliper against the surface of the skin, which could alter the results. All measurements were taken twice in order to ensure greater reliability. The final measurement was obtained using the mean in millimeters of the two measurements taken[5,6,8].

The following measurements were taken:

- facial height: distance between the glabella and gnathion (g-gn);
- middle third of the face: distance between the glabella and subnasal point (g-sn);
- lower third of the face: distance between the subnasal point and gnathion (sn-gn);
- right side: distance from the outer edge of the right eye to the right labial commisure (ex-ch);
- left side: distance from the outer edge of the left eye to the left labial commisure (ex-ch);
- upper lip height: distance from the subnasal point to the lowest point of the upper lip (sn-sto);
- lower lip height: distance from the highest point of the upper lip to the gnathion (sto-gn);
- facial width: distance between the uppermost points of the zygomatic arches (zy-zy).

The children were submitted to cephalometric assessment to determine their facial type based on Ricketts' VERT index[9]. The VERT index was obtained based on the arithmetic mean of the five facial classification values: facial axis angle; facial depth; mandibular plane angle; lower facial height; mandibular arch. Values above 0.5 indicate a brachyfacial type;

between -0.5 and +0.5 mesofacial; and less than -0.5 dolichofacial[3,5].

In data analysis, the Kolmogorov-Smirnov test was applied to determine the normality of anthropometric orofacial measurement distribution. Anthropometric measurements were compared between the facial types and sexes by analysis of variance (ANOVA) and Tukey's test was used for multiple comparisons. Statistical analyses were performed using SPSS (Statistical Package for Social Sciences, version 20), considering a 5% significance level.

RESULTS

Table 1 shows the distribution of facial types in the sample according to sex, obtained by descriptive analysis of the data.

Table 1. Distribution of the different facial types according to sex

	Boys n (%)	Girls n (%)	Total n (%)
Brachyfacial	19(30.64)	36(56.25)	55(43.65)
Mesofacial	23(37.10)	17(26.56)	40(31.75)
Dolichofacial	20(32.26)	11(17.19)	31(24.60)
Total	62 (100)	64 (100)	126 (100)

Legend: n – number of chidren, % - percentage

Tables 2 and 3 show the comparison between the anthropometric measurements of the facial types in boys and girls, respectively. A significant difference was observed in the lower third (sn-gn) among the boys and in facial height (g-gn), lower third (sn-gn) and lower lip (sto-gn) among girls.

Table 2. Comparison between the anthropometric orofacial measurements, in millimeters, of the facial types in boys

Facial Measurements	Brachyfacial (n=19)		Mesofacial (n=23)		Dolichofacial (n=20)		p
	Mean	SD	Mean	SD	Mean	SD	
Facial Height	108.18	24.09	116.65	7.22	115.89	7.85	0.142
Middle Third	55.71	5.69	56.18	4.88	56.63	5.53	0.866
Lower Third	58.26[a,b]	3.85	61.71[b]	3.40	61.81[a]	4.80	0.010*
Right Side	60.71	7.13	63.25	7.43	64.92	5.50	0.157
Left Side	60.60	7.12	63.49	6.97	64.77	4.75	0.124
Upper Lip	20.20	1.49	20.81	2.04	20.67	1.89	0.541
Lower Lip	37.55	2.83	40.65	5.61	40.16	3.52	0.055
Facial Width	123.77	10.54	126.74	7.92	125.36	7.36	0.567

Legend: n – number of children; SD – standard deviation; *Significance according to Analysis of Variance - ANOVA ($p<0.05$); Same letters: difference between the groups according to Tukey's test

Table 3. Comparison between the anthropometric orofacial measurements, in millimeters, of the facial types in girls

Facial measurements	Brachyfacial (n=36)		Mesofacial (n=17)		Dolichofacial (n=11)		p
	Mean	SD	Mean	SD	Mean	SD	
Facial Height	112.90	6.77	109.35[a]	8.90	117.65[a]	9.09	0.030*
Middle Third	56.46	5.29	53.55	5.87	56.80	6.09	0.173
Lower Third	57.03[a]	4.40	58.97	3.36	62.02[a]	6.02	0.007*
Right Side	61.18	8.69	63.21	4.95	65.39	6.50	0.245
Left Side	61.16	8.05	62.82	4.54	64.97	6.75	0.281
Upper Lip	19.07	1.82	19.40	1.97	20.09	2.13	0.307
Lower Lip	36.67[a]	6.01	39.09	3.04	41.86[a]	4.90	0.015*
Facial Width	124.33	7.28	122.93	8.95	128.46	7.20	0.181

Legend: n – number of children; SD – standard deviation; *Significance according to Analysis of Variance - ANOVA (p<0,05); Same letters: difference between the groups according to Tukey's test

Table 4 displays the comparison of anthropometric measurements regardless of sex. A significant difference was recorded in measurements for the lower third (sn-gn), right side of the face (ex-ch), left side of the face (ex-ch), upper lip (sn-sto) and lower lip (sto-gn).

Table 4. Comparison between the anthropometric orofacial measurements, in millimeters, of the facial types in the 126 children studied

Facial measurements	Brachyfacial (n=55)		Mesofacial (n=40)		Dolichofacial (n=31)		p
	Mean	SD	Mean	SD	Mean	SD	
Facial Height	111.27	15.11	113.65	8.65	116.52	8.20	0.146
Middle Third	56.20	5.39	55.06	5.41	56.69	5.64	0.421
Lower Third	57.46[a,b]	4.23	60.54[b,c]	3.61	61.89[a,b,c]	5.17	p<0.001*
Right Side	61.02[a]	8.12	63.23	6.39	65.09[a]	5.77	0.036*
Left Side	60.96[a]	7.68	63.20	5.97	64.84[a]	5.44	0.032*
Upper Lip	19.46[a]	1.78	20.21	2.11	20.46[a]	1.96	0.044*
Lower Lip	36.97[a,b]	5.13	39.99[b]	4.71	40.77[a]	4.06	0.001*
Facial Width	124.14	8.40	125.14	8.47	126.46	7.34	0.462

Legend: n – number of children; SD – standard deviation; *Significance according to Analysis of Variance - ANOVA (p<0.05); Same letters: difference between the groups according to Tukey's test

DISCUSSION

Descriptive analysis of the results of Table 1 found that, although a higher number of mesofacial participants were boys, distribution was similar for the three facial types, whereas more than half of the girls were brachyfacial. Analysis of the distribution of the entire sample showed that brachyfacial individuals were the most common, followed by the mesofacial and dolichofacial types.

In national studies, Ricketts' VERT index showed differences in the occurrence of facial types in the samples studied. In a study of 88 subjects with a mean age of 10 years and three months, the predominant facial type was dolichofacial, followed by mesofacial and brachyfacial[10]. An investigation with 105 participants aged between 20 and 40 years found greater frequency of the brachyfacial type in men and a similar number of brachyfacial and mesofacial women, with fewer dolichofacial individuals in both sexes[4].

It is believed that the variation in facial type distribution in these samples occurred due to the influence of different factors on the facial growth pattern, such as sex, aged and race. Another important aspect to consider is the susceptibility of growth and craniofacial development to variables such as nutrition, disease, socioeconomic factors, hereditary factors and functional alterations[11].

Anthropometric orofacial measurements were also compared between facial types considering the sexes

separately, since previous studies indicate differences in the means of these measurements between men and women, which are frequently higher in the former[2,7,12]. In the present study, the means of some orofacial measurements for the different facial types were higher among girls than boys, which may be associated with the higher average age of the girls.

No studies were found in the literature that compared anthropometric orofacial measurements in the facial types of children. As such, the results of this study were compared against those from an investigation with adolescents[13] and another with adults[2].

The comparison between anthropometric measurements for the different facial types in the boys (Table 2) showed a significant difference in measurements of the lower third (sn-gn), which was smaller in brachyfacial subjects when compared to the mesofacial and dolichofacial children. Another study also found a significant difference in lower third height (sn-gn) among adult subjects, with the lowest measurement recorded in brachyfacial participants and the highest for mesofaciais and dolichofacial types[2].

Table 3 shows the comparison of facial measurements between the facial types in girls, indicating lower facial height (g-gn) in the mesofacial subjects when compared to dolichofacial individuals, as well as a significantly smaller lower third (sn-gn) and lower lip height (sto-gn) in brachyfacial compared to dolichofacial girls.

A study of 105 adults aged between 20 and 40 years found a significant difference in the measurements of anterior facial height (g-gn), height of the lower third, middle face height, and lower face height between the three facial types in both boys and girls[2].

A comparison of facial measurements for the different facial types regardless of sex demonstrated a significantly smaller lower third (sn-gn), right (ex-ch) and left side of the face (ex-ch), and upper (sn-sto) and lower lips (sto-gn) in brachyfacial subjects compared to mesofacial and dolichofacial individuals. A similar study with a sample of 39 adolescents aged from 15 to 17 years found significantly higher values for upper lip height (sn-sto) and lower third (sn-gn) in the dolichofacial participants. There was no significant difference in lower lip height (sto-gn), middle face (g-sn) and right (ex-ch) and left sides of the face (ex-ch)[13].

The results of this study demonstrated that anthropometric orofacial measures differed among the facial types. Moreover, vertical growth vectors were lower in brachyfacial subjects and higher in dolichofacial individuals, suggesting that anthropometric measurements changed as expected for the facial types obtained using Ricketts' VERT index.

Thus, it is suggested that facial type may influence anthropometric orofacial measurements, reinforcing the need to consider this variable in studies that include anthropometric orofacial assessment.

CONCLUSION

Based on the results of this study, it can be concluded that anthropometric orofacial measurements were lower in brachyfacial than mesofacial and dolichofacial children, which was most evident in measurements related to the lower and transverse vertical plane.

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