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ARTICLES

Does the breathing pattern influence the orofacial anthropometric measurements of children?

O padrão respiratório influencia as medidas antropométricas orofaciais de crianças?

¿El patrón respiratorio influye en las mediciones antropométricas orofaciales de los niños?

Thamires Ferreira Oratch[1]
Thaís Hilgemberg[2]
Gilsane Raquel Czlusniak[1]
Vanessa Cristina de Godoi[1]

Abstract

Introduction: Breathing is vital for the body, and the most physiologically appropriate breathing mode is through the nose. Mouth breathing can lead to several adaptations to the stomatognathic system, including facial asymmetries and increased facial height. It is important to identify these cases early in childhood so that these changes can be minimized or even eliminated in the future, allowing for proper development. **Objective:** To identify the influence of the protection pattern on the orofacial anthropometric measurements of children, in relation to sex and age group. **Methodology:** This was an observational, analytical, descriptive study with a quantitative approach. Data collection was carried out through the analysis of CEFONO medical records for the group of mouth-breathing (MB) children, and anthropometric measurements of width, height, and facial thirds were performed using a digital caliper on nasal-breathing (NB) children recruited by the researchers. The data were organized in spreadsheets and statistically analyzed with a significance level of 5% ($p<0.05$). Results: 200 children participated in the study, 100 in the research group (MB) and 100 in the control group (NB). There were differences in

[1] Universidade Estadual do Centro-Oeste, Irati, PR, Brazil.
[2] Pontifícia Universidade Católica do Paraná, Curitiba, PR, Brazil.

Authors' contributions:
TFO: study conception; methodology; data collection; article outline.
TH: methodology; article outline; critical review.
GRC: methodology; article outline; critical review.
VCG: study conception; methodology; data collection; article outline; critical review.

E-mail for correspondence: thamiresferreiraoratch@gmail.com
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the measurement from the corner of the right eye to the right lip in the NB group ($p<0.031$), with higher values obtained for boys. When comparing the results of facial measurements according to age group, differences were observed between groups for the variable «Glabella to Sub-nasal», in both age groups. **Conclusion:** Oral breathing patterns in children are associated with differences in orofacial anthropometric measurements, especially in the midface.

Keywords: Anthropometry; Mouth breathing; Speech, Language and Hearing Sciences .

Resumo

Introdução: A respiração é vital para o organismo, e o modo respiratório fisiologicamente mais adequado se dá pelo nariz. Respirar pela boca pode trazer diversas adaptações para o sistema estomatognático, o que inclui assimetrias faciais e aumento da altura da face. É importante identificar estes casos já na infância para que futuramente essas alterações sejam minimizadas ou até eliminadas e o desenvolvimento aconteça de maneira adequada. **Objetivo:** Identificar a influência do padrão respiratório nas medidas antropométricas orofaciais de crianças, com relação ao sexo e à faixa etária. **Metodologia:** Estudo observacional, analítico, de caráter descritivo, com abordagem quantitativa. A coleta de dados se deu por meio da análise de prontuários da CEFONO para o grupo de crianças respiradoras orais (RO), e foi realizada a medição antropométrica da largura, altura e terços faciais, utilizando um paquímetro digital, de crianças respiradoras nasais (RN) que foram recrutadas pelas pesquisadoras. Os dados foram organizados em planilhas e analisados estatisticamente com nível de significância de 5% ($p<0,05$). **Resultados:** Participaram da pesquisa 200 crianças, sendo 100 no grupo pesquisa (RO)e 100 no grupo controle (RN). Houve diferenças para a medida do canto de olho direito a lábio direito no grupo RN ($p<0,031$), com maiores valores obtidos para meninos. A comparação dos resultados das medidas faciais de acordo com a faixa etária, observou diferenças entre grupos para a variável “Glabela a Sub-nasal”, em ambas as faixas etárias. **Conclusão:** O padrão respiratório oral em crianças está associado a diferenças em medidas antropométricas orofaciais, especialmente no terço médio da face.

Palavras-chave: Antropometria; Respiração oral; Fonoaudiologia.

Resumen

Introducción: La respiración es vital para el cuerpo, y el modo de respiración más apropiado desde el punto de vista fisiológico es por la nariz. La respiración bucal puede provocar diversas adaptaciones en el sistema estomatognático, como asimetrías faciales y aumento de la altura facial. Es importante identificar estos casos en la infancia temprana para minimizar o incluso eliminar estos cambios en el futuro, lo que permite un desarrollo adecuado. **Objetivo:** Identificar la influencia del patrón de protección en las medidas antropométricas orofaciales de niños, en relación al sexo y grupo etario. **Metodología:** Este fue un estudio observacional, analítico, descriptivo con un enfoque cuantitativo. La recolección de datos se llevó a cabo a través del análisis de los registros médicos de CEFONO para el grupo de niños con respiración bucal (MB), y las mediciones antropométricas de ancho, altura y tercios faciales se realizaron utilizando un calibrador digital en niños con respiración nasal (NB) reclutados por los investigadores. Los datos se organizaron en hojas de cálculo y se analizaron estadísticamente con un nivel de significancia del 5% ($p<0,05$). Resultados: 200 niños participaron en el estudio, 100 en el grupo de investigación (MB) y 100 en el grupo de control (NB). Hubo diferencias en la medición desde el ángulo del ojo derecho hasta el labio derecho en el grupo NB ($p<0,031$), con valores más altos obtenidos para los niños. Al comparar los resultados de las mediciones faciales según el grupo de edad, se observaron diferencias entre los grupos para la variable “Glabela a Subnasal”, en ambos grupos de edad. **Conclusión:** Los patrones de respiración oral en los niños están asociados con diferencias en las mediciones antropométricas orofaciales, especialmente en la zona media del rostro.

Palabras clave: Antropometría; Respiración oral; Fonoaudiología.

Introduction

Breathing is vital to the organism. Physiologically, the most appropriate breathing mode occurs through the nose, since when air enters through the nasal cavities, it is humidified, warmed, and filtered. Through these processes, gas exchange in the lungs and oxygenation of the body are improved[1].

However, the literature uses the term "oral breather" to describe individuals who breathe exclusively through the mouth, keeping the oral cavity constantly open without lip sealing. This breathing pattern may cause speech, dental, and skeletal alterations, as well as affect facial aesthetics, body posture, among other aspects[1].

Oral breathing has been identified as an important cause of malocclusion. Breathing through the mouth may compromise the shape and contour of the dental arches, as well as the entire nasomaxillary process. Furthermore, the orofacial muscles develop asymmetrically, affecting the functions performed by the lips, cheeks, and tongue[2]. Such morphological alterations consequently lead to myofunctional imbalances.

Authors have observed that the effects of oral breathing are always visible on children's faces[2]. Generally, the nose is smaller and shorter, with straight nasal wings; the mouth remains continuously open; the upper lip is short; and the mandible is retruded, probably due to unbalanced muscle pressure[2].

Facial growth may be influenced by genetic factors, following a facial pattern similar to that of the parents, or by external factors that contribute to its development. The longer a child with oral breathing habits maintains this pattern, the greater the future damage to the facial structures, generating craniofacial, postural, and systemic alterations[3].

According to the literature, oral breathing may lead to several adaptations in the stomatognathic system, including facial asymmetries and increased facial height[4]. Therefore, it is important to identify these cases during childhood so that such alterations may be minimized or even eliminated in the future, allowing development to proceed appropriately.

One of the methods used in the assessment of orofacial myofunctional disorders is facial anthropometry, which studies craniofacial morphology. In this evaluation, measurements are taken from specific points on the subject's face in a non-invasive manner using a caliper. This method corresponds to a quantitative facial assessment and may contribute to evaluations of the lingual frenulum, facial paralysis, facial aesthetics, the study of masticatory predominance, among others[5].

Given the above, this research is justified by the need to identify differences in the orofacial anthropometry of oral breathing children, in order to discuss the aspects of the face that may be affected and to promote discussion regarding the role of the speech-language pathologist in these cases.

The objective of this study was to identify the influence of breathing patterns on the orofacial anthropometric measurements of children, in relation to sex and age group.

Methodology

This is an observational, analytical, descriptive study with a quantitative approach. The present research complied with all standards established by Resolution 466/2012 of the Brazilian National Health Council regarding ethical aspects of research involving human subjects. The project was approved by the Research Ethics Committee under opinion number 7.190.716/2024 and CAAE 83929424.5.0000.8967. Subjects whose legal guardians signed the Free and Informed Consent Form (ICF) agreeing to participation in the study were included.

The study population consisted of 200 children, including 100 children in the research group (Oral Breathers - OB) and 100 in the control group (nasal breathers - NB). The research group included children aged 4 to 12 years diagnosed as oral breathers and referred for tonsillectomy and/or adenoidectomy surgery by an otorhinolaryngologist. The diagnosis of oral breathing with surgical indication was performed by the otorhinolaryngologist through clinical examination (oroscopic evaluation of tonsillar hypertrophy of the palatine tonsils, also assessing recurrent tonsillitis and caseous tonsillitis – tonsilloliths), radiological imaging examination (cavum X-ray), and nasofibroscopy using a 3 mm flexible nasofibroscope for direct visualization of the nasopharynx and hypertrophy of the superior pole of the palatine tonsils in the oropharynx.

Children diagnosed with OB participated in an extension project at the institution's Speech-Language Pathology Teaching Clinic (CEFONO), which maintained a partnership with an otorhinolaryngologist who referred children on the waiting list for tonsil and/or adenoid surgeries. All evaluations of these children were performed by a speech-language pathologist specialized in orofacial myofunctional therapy.

The recruitment of the NB children sample was carried out through the researchers' contacts using non-probabilistic sampling[6]. In this way, participants referred new contacts with the desired characteristics for the study. Thus, the control group included children aged 4 to 12 years without complaints or diagnoses of nasal pathologies or respiratory alterations. Exclusion criteria included diagnosis and/or self-report by guardians of neurological, syndromic, psychiatric, metabolic, and/or endocrinological disorders, previous surgeries in the head and neck region, and previous speech-language therapy treatment.

Data collection was performed at a Speech-Language Pathology Teaching Clinic in two stages. In the first stage, medical records of OB pediatric patients assisted in the extension project were analyzed. In the second stage, NB children were recruited through the researchers' contacts, and orofacial anthropometric measurements were performed by a fourth-year speech-language pathology student under the supervision of a certified speech-language pathologist specialized in Orofacial Myofunctional Therapy.

For the measurements, a digital stainless-steel caliper manufactured by NYBC, model Universal Inox - Electronic Digital Caliper (Sliding Caliper), with a measurement range of 150 mm and precision of 0.01 mm (0.0005 - 1/64"), manufactured in Spain, was used according to the measurements proposed by the MBGR protocol[7].

To obtain the orofacial anthropometric measurements, the following reference points were considered: trichion (tr), corresponding to the midpoint of the forehead at the hairline insertion; glabella (g), corresponding to the central region between the eyebrows; subnasal (sn), located medially at the inferior border of the nasal septum; stomion (sto), an imaginary point located at the intersection between the vertical midline connecting the trichion (tr), subnasal (sn), and gnathion (gn), and the horizontal line of the mouth slit when the lips are gently closed and the teeth are in occlusion; gnathion (gn), located at the medial and inferior portion of the chin; external canthus of the eye (ex); and cheilion (ch), referring to the labial commissures[8].

Based on the reference points mentioned above, the following measurements were obtained: upper facial third (tr-g): measurement from the trichion to the glabella; middle facial third (g-sn): measurement from the glabella to the subnasal; lower facial third (sn-gn): measurement from the subnasal to the gnathion; facial height (g-gn), corresponding to the sum of the middle and lower facial thirds; distances between the external canthus of the eye and the labial commissure on the right and left sides (ex-ch); and the lengths of the upper lip (sn-sto) and lower lip (sto-gn)[8].

All measurements were obtained in millimeters (mm), and each measurement was performed three times to ensure greater reliability of the results. Subsequently, the arithmetic mean of each measurement was calculated, following the protocol adopted in this study[7].

After the measurements, the data were tabulated and statistically analyzed. Initially, descriptive analysis of the continuous variables was performed, obtaining measures of central tendency (mean and median) and dispersion (minimum, maximum, and standard deviation – SD). Categorical variables were distributed according to frequency (n) and percentage.

For inferential analysis, the Shapiro-Wilk test was initially applied to assess the distribution of the variables. Given normal distribution, Student's t-test was used for comparison between two independent groups regarding a quantitative variable. In cases of non-normal distribution, the non-parametric Mann–Whitney test was adopted for comparison between two independent groups regarding a quantitative variable.

To assess the association between sex and type of breathing, Pearson's Chi-square test was used. For the correlation between quantitative variables, Spearman's Correlation Test was adopted, with the possible strengths interpreted as follows: $r = 0.1$ to 0.29: weak correlation; $r = 0.3$ to 0.49: moderate correlation; $r = 0.5$ to 1.0: strong correlation[9].

For all analyses, a significance level of 5% ($p < 0.05$) was adopted.

Results

A total of 200 children participated in the study and were divided into a research group composed of 100 oral breathers (OB) and a control group composed of 100 nasal breathers (NB). The OB group presented a mean age of 7.9 years (±2.5) (minimum 4 and maximum 12), while the NB group presented a mean age of 7.4 years (±2.2) (minimum 4 and maximum 12). There was no difference between the groups regarding age (p=0.13). Regarding sex, the OB group consisted of 38 (38%) girls and 62 (62%) boys, while the NB group included 41 (41%) girls and 59 (59%) boys. There was no statistically significant difference between the groups regarding sex (p=0.77).

The comparison results of orofacial measurements between the OB and NB groups were obtained. There was a statistically significant difference for the glabella-to-subnasale measurement (g-sn) (median 55.7 in OB and 51.00 in NB – p<0.000) and the right eye corner-to-right lip commissure distance (ex-ch) (median 64.00 in OB and 60.00 in NB – p<0.004), with higher values observed in the OB group compared to the NB group (Table 1).

Table 1. Comparison of orofacial measurements between Oral Breathers (OB) and Nasal Breathers (NB)

	Oral Breathers (OB)						Nasal Breathers (NB)						p
Variable	**n**	**Avg.**	**Med.**	**Min.**	**Max.**	**SD**	**n**	**Avg.**	**Med.**	**Mín.**	**Max.**	**SD**	
Glabella to Subnasal (g-sn)***	99	63,74	55,70	39,50	117,00	21,86	100	51,84	51,00	21,50	103,50	9,66	**0,000***
Subnasal to Gnathion (sn-gn)**	100	47,90	48,45	25,00	68,00	9,27	100	48,62	50,00	23,60	68,00	7,34	0,599
Face Height (g-gn)***	100	111,88	102,95	78,00	180,60	27,20	100	100,51	100,50	45,10	157,00	13,85	0,060
Right Eye Corner to Right Lip (ex-ch)***	99	63,79	64,00	6,60	106,00	9,75	100	60,78	60,00	21,00	78,00	8,25	**0,004***
Left Eye Corner to Left Lip (ex-ch)***	98	61,70	62,20	6,60	73,50	7,54	100	60,83	61,50	19,00	78,00	8,28	0,272
Upper Lip (sb-sto)***	100	17,88	17,45	8,56	64,00	7,45	100	16,41	17,00	6,10	30,80	4,17	0,204
Lower Lip (sto-gn)**	99	29,61	31,00	13,50	48,00	7,54	100	29,13	30,30	10,00	56,00	7,63	0,650

*p<0,05
**Student's t-test
***Mann–Whitney test
Source: The author (2025)

Additionally, comparisons of orofacial measurements between sexes were performed in both groups (OB and NB) (Tables 2 and 3). A statistically significant difference was observed only for the right eye corner-to-right lip commissure measurement (ex-ch) in the NB group (median 59.00 in females and 62.10 in males; p<0.031), with higher values found in male children (Table 3).

Table 2. Comparison of Orofacial Measurements Between Sexes in the Oral Breathers (OB) Group

Oral Breathers (OB) Group	**Female**						**Male**						**p**
	n	**Avg.**	**Med.**	**Min.**	**Max.**	**SD**	**n**	**Avg.**	**Med.**	**Min.**	**Max.**	**SD**	
Glabella to Subnasal (g-sn)***	38	57,07	54,17	39,50	109,30	15,81	61	67,90	56,60	40,10	117,00	24,09	0,071
Subnasal to Gnathion (sn-gn)**	38	48,27	46,95	29,55	68,00	8,79	62	47,68	49,10	25,00	65,00	9,61	0,806
Face Height (g-gn)***	38	105,28	99,65	81,40	171,40	21,15	62	115,93	104,25	78,00	180,60	29,75	0,225
Right Eye Corner to Right Lip (ex-ch)***	38	65,65	63,50	53,40	106,00	10,61	61	62,63	64,30	6,60	75,40	9,06	0,773
Left Eye Corner to Left Lip (ex-ch)***	38	62,26	62,00	51,30	73,50	5,68	60	61,34	62,40	6,60	72,10	8,54	0,997
Upper Lip (sb-sto)***	38	18,48	16,95	8,56	64,00	10,43	62	17,50	17,81	9,80	34,00	4,87	0,553
Lower Lip (sto-gn)**	38	30,12	31,15	14,00	45,51	7,06	61	29,29	30,00	13,50	48,00	7,86	0,592

*p<0,05
**Student's t-test
***Mann–Whitney test
Source: The author (2025)

Table 3. Comparison of Orofacial Measurements Between Sexes in the Nasal Breathers (NB) Group

Nasal Breathers (NB) Group	**Female**						**Male**						**p**
	n	**Avg.**	**Med.**	**Min.**	**Max.**	**SD**	**n**	**Avg.**	**Med.**	**Min.**	**Max.**	**SD**	
Glabella to Subnasal (g-sn)***	41	49,90	47,20	21,50	70,00	8,36	59	53,18	51,00	34,00	103,50	10,32	0,092
Subnasal to Gnathion (sn-gn)**	41	47,39	48,10	23,60	62,00	6,72	59	49,48	50,00	31,49	68,00	7,69	0,146
Face Height (g-gn)***	41	97,82	96,30	45,10	120,00	12,96	59	102,38	103,00	75,00	157,00	14,24	0,184
Right Eye Corner to Right Lip (ex-ch)***	41	59,07	59,00	26,00	75,00	7,77	59	61,97	62,10	21,00	78,00	8,42	**0,031***
Left Eye Corner to Left Lip (ex-ch)***	41	59,86	60,70	29,50	74,00	7,68	59	61,51	62,00	19,00	78,00	8,67	0,296
Upper Lip (sb-sto)***	41	16,10	16,10	6,10	24,60	3,56	59	16,63	17,00	9,00	30,80	4,57	0,621
Lower Lip (sto-gn)**	41	30,02	31,40	15,70	44,00	5,31	59	28,51	30,00	10,00	56,00	8,89	0,468

*p<0,05
**Student's t-test
***Mann–Whitney test
Source: The author (2025)

When comparing the results of orofacial measurements according to age group (4 to 8 years and 9 to 12 years), a statistically significant difference between the groups was observed only for the variable "glabella-to-subnasal (g-sn)" in both age ranges (4 to 8 years – median 53.15 in OB and 49.00 in NB; p<0.01; 9 to 12 years – median 57.00 in OB and 53.38 in NB; p<0.03) (Table 4).

Table 4. Comparison Between the Oral Breather and Nasal Breather Groups According to Age Range

4 to 8 years	Oral Breathers						Nasal Breathers						p
	n	Avg.	Med.	Min.	Max.	SD	n	Avg.	Med.	Min.	Max.	SD	
Glabella to Subnasal (g-sn)***	52	60,34	53,15	39,50	113,30	21,52	71	49,92	49,00	21,50	103,50	9,57	**0,01***
Subnasal to Gnathion (sn-gn)**	53	45,12	44,00	25,00	62,52	8,99	71	46,45	47,00	23,60	60,00	6,71	0,35
Face Height (g-gn)***	53	105,97	94,60	78,00	166,90	27,06	71	96,39	96,30	45,10	157,00	13,14	0,70
Right Eye Corner to Right Lip (ex-ch)***	52	60,78	61,00	50,80	69,30	4,73	71	58,77	59,00	21,00	77,00	8,01	0,10
Left Eye Corner to Left Lip (ex-ch)***	52	59,91	59,95	50,10	67,20	4,10	71	58,71	60,00	19,00	76,00	8,18	0,40
Upper Lip (sb-sto)***	53	15,53	16,00	9,80	21,60	3,38	71	15,77	16,00	6,10	30,80	3,78	0,91
Lower Lip (sto-gn)**	53	27,50	26,00	14,30	43,27	7,21	71	28,44	30,00	10,00	45,00	6,79	0,28
9 to 12 years	**Oral Breathers**						**Nasal Breathers**						**p**
	n	**Avg.**	**Med.**	**Min.**	**Max.**	**SD**	**n**	**Avg.**	**Med.**	**Min.**	**Max.**	**SD**	
Glabella to Subnasal (g-sn)***	47	67,51	57,00	44,00	117,00	21,83	29	56,53	53,38	46,80	85,00	8,28	**0,03***
Subnasal to Gnathion (sn-gn)**	47	51,04	52,90	35,00	68,00	8,63	29	53,93	54,20	41,50	68,00	6,10	0,14
Face Height (g-gn)***	47	118,55	108,00	85,90	180,60	26,05	29	110,60	110,00	92,90	139,20	9,90	0,90
Right Eye Corner to Right Lip (ex-ch)***	47	67,13	66,30	6,60	106,00	12,49	29	65,71	66,10	50,00	78,00	6,70	0,63
Left Eye Corner to Left Lip (ex-ch)***	46	63,71	65,60	6,60	73,50	9,79	29	66,02	66,00	51,00	78,00	5,96	0,30
Upper Lip (sb-sto)***	47	20,52	18,90	8,56	64,00	9,64	29	17,98	18,00	9,70	30,10	4,72	0,28
Lower Lip (sto-gn)**	46	32,04	32,45	13,50	48,00	7,24	29	30,82	32,00	11,00	56,00	9,30	0,51

p<0,05
**Student's t-test
***Mann–Whitney test
Source: The author (2025)

The variable age was correlated with the variable "facial height (g-gn)" in both groups (Table 5). A statistically significant positive correlation was observed in this relationship in both groups, indicating a tendency toward a linear relationship between the variables. Thus, it can be inferred that as age increases, facial height also increases. It is important to note that the strength of the correlation was considered strong for the NB group (r<0.67) and moderate for the OB group (r<0.46), indicating that the strength of the linear relationship is greater in the NB group.

Table 5. Correlation Between the Variables Age and Facial Height Measurement (g-gn) in the Oral Breather (OB) and Nasal Breather (NB) Groups

	Face Height (g-gn)	
OB Group	**corr. coef. (r)**	**p**
Age	0,46	**0,00***
NB Group	**corr. coef. (r)**	**p**
Age	0,67	**0,00***

Spearman Correlation Test; *p < 0.05
Source: The author (2025)

Discussion

The main purpose of this study was to identify whether breathing patterns influence the orofacial anthropometric measurements of children by comparing the anthropometric measurements of oral breathers and nasal breathers. The study was conducted with 200 children of both sexes, divided into two groups: 100 oral breathers (OB - research group) and 100 nasal breathers (NB – control group). Based on the results, a higher prevalence of OB was observed among male children (62%), a finding that corroborates other data reported in the literature on this subject[5–10]. This finding highlights the importance of conducting further studies involving the same age range and sex in order to analyze possible causes related to these variables.

It should be noted that this study did not investigate other deleterious oral habits in the study group, nor associated behavioral factors in the control group. The comparison was performed exclusively between OB and NB children. However, it is acknowledged that the inclusion of these variables in future studies may broaden the understanding of the findings, considering that deleterious oral habits may influence craniofacial growth and have a direct relationship with orofacial anthropometric measurements, representing an important limitation of the present study.

When comparing the measurements of the middle third of the face (g-sn), significant differences were observed in the OB group compared to the NB group. The glabella (g) to subnasal (sn) measurement presented a mean of 63.74 in the OB group. Furthermore, differences were also observed between the groups regarding the measurement from the right external canthus of the eye to the right labial commissure (ex-ch), with a mean of 63.79, indicating higher values in the OB group, as shown in Table 1. Similar findings were also reported in another study[10].

A study conducted with 60 individuals aged 7 to 39 years aimed to compare orofacial anthropometric measurements according to breathing mode, correlate orofacial measurements with age/breathing, and correlate breathing type with facial measurements. The study concluded that breathing patterns impact the distances involving the external canthus of the eye (ex) and that oral breathing influences the measurements of the middle third of the face (g-sn)[11], similarly to the findings observed in the present research.

In addition to the general objective, the results demonstrated that there are orofacial differences between breathing patterns, with the faces of OB individuals being longer than those of NB individuals. According to the literature, OB patients are prone to presenting changes in craniofacial proportions, such as vertical growth pattern, greater mandibular inclination, increased anterior and lower facial height, and reduced posterior facial height, all of which indicate that oral breathing influences facial development[2].

Complementing this finding, a study aimed at evaluating orofacial anthropometric measurements according to facial type in children of both sexes aged seven to 11 years and 11 months concluded that orofacial anthropometric measurements were smaller in brachyfacial children than in mesofacial and dolichofacial children[12]. As previously mentioned, OB individuals tend to present a dolichofacial pattern and, consequently, larger anthropometric measurements than individuals with a brachyfacial pattern. This was confirmed both in the cited study[12] and in the present research.

Another aspect prioritized throughout the study was verifying whether there were differences in the measurements according to the children's age, as presented in Table 4. It was observed that the effect of breathing pattern occurred consistently across the analyzed age groups, since differences were identified in the middle third of the face (g-sn). However, differences were found in both younger and older children, indicating that these differences do not emerge only with increasing age, as both younger and older OB children presented such differences.

The same interpretation may be applied to Table 5 regarding facial height, since this measurement increased with age in both study groups. As the children grew, facial height (g-gn) also increased regardless of breathing pattern, representing a normal physiological growth process of the human body. It is important to emphasize that, according to the literature, facial growth is multifactorial and may also be influenced by genetic factors[2].

Furthermore, differences were observed in the measurement from the right external canthus of the eye to the right labial commissure (ex-ch) in NB children, predominantly among males. A study investigating the relationship between oral breathing of obstructive and functional etiology and prolonged non-nutritive sucking habits in the development of structural alterations of the stomatognathic system in 78 children aged seven to 11 years demonstrated cheek asymmetry in children with prolonged non-nutritive sucking habits[4]. Although asymmetry was identified in NB children in the present study, prolonged non-nutritive sucking habits may be considered a possible causal factor for these findings; however, this variable was not investigated in the current study.

Given these findings, further research is needed to analyze the aforementioned data and the possible causes that may lead to this facial asymmetry, especially through comparisons between OB and NB individuals. Another hypothesis that may be considered relates to the preferential chewing side, in which the ipsilateral facial musculature works more actively in comparison with the opposite side, potentially leading to increased development on that side[13]. Craniofacial and functional alterations involved in unilateral mastication may also be considered, such as dental arch asymmetry, dental crowding, anterior open bite, posterior crossbite, and muscular imbalances, which may favor the prevalence of a unilateral chewing pattern[14].

As evidenced in this study, there are orofacial differences between OB and NB children (Table 1), and therefore attention must be given to the long-term orofacial development of children. The age group investigated is at the peak of growth, and children who present harmful oral habits, especially those related to a predominantly oral breathing pattern, may experience complications during growth, including respiratory, motor, and sensory impairments[15].

Other authors[3] report that OB promotes anterior head posture and head extension in order to facilitate airflow through the upper and lower airways, in addition to other alterations that may be observed in OB individuals. Therefore, interdisciplinary treatment involving speech-language pathologists, otorhinolaryngologists, and orthodontists is necessary for early diagnosis and treatment, aiming to improve the well-being and future quality of life of these children.

Speech-language pathology intervention in these cases aims to promote health through a comprehensive patient evaluation. This assessment involves identifying alterations in the stomatognathic system, speech, and orofacial musculature. Based on these findings, the speech-language pathologist develops a therapeutic plan focused on correcting altered functions, with the ultimate goal of restoring the nasal breathing pattern, an essential condition for maintaining harmonious airflow through the respiratory tract.

Thus, the results of this study highlight the importance of considering orofacial measurements in pediatric speech-language pathology assessments, since these data make it possible to measure and quantify the alterations presented, as well as to guide treatment objectively and clearly, thereby improving clinical practice and its implications for speech-language therapy outcomes.

As a limitation of the study, the use of data obtained from medical records for the OB group is highlighted, in contrast to the direct data collection performed in the control group, which may have introduced measurement bias. In addition, the absence of systematic investigation of other deleterious oral habits and behavioral factors in the control group should be noted, since these variables may influence orofacial growth and anthropometric measurements.

Conclusion

The results of this study suggest that oral breathing patterns in children are associated with differences in orofacial anthropometric measurements, especially in the middle third of the face (g-sn).

These differences were observed in both analyzed age groups, indicating that they are not dependent on increasing age. Regarding sex, no consistent differences were identified between the groups, except for the ex-ch measurement (distance between the external canthus of the eye and the labial commissure) in the NB group.

However, these findings should be interpreted with caution, considering the methodological limitations and the need for additional studies to further investigate this relationship.

Given this evidence, the importance of early identification of alterations in children's breathing patterns is emphasized. When an oral breathing pattern is identified, evaluation by healthcare professionals such as speech-language pathologists, otorhinolaryngologists, and orthodontists is recommended in order to provide accurate diagnosis and individualized management.

Follow-up by a multidisciplinary team is considered relevant, since it allows for a more comprehensive assessment by integrating different clinical perspectives for the definition of the most appropriate therapeutic plan and for adequate monitoring of craniofacial growth and development.

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