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Influence of Age on Orofacial Functions and the Perception of Sleep Disorders Associated with Obese Individuals

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Abstract

Background: This comparative observational study investigated the impact of age on orofacial functions and the perception of sleep disorders in obese individuals. **Methods:** 48 obese individuals aged 7–40 years, divided into three groups: Group I (7–11 years, *n* = 16), Group II (12–20 years, *n* = 16), and Group III (21–40 years, *n* = 16). All participants had full dentition, except Group I, which had mixed dentition, and none had temporomandibular dysfunction. Masseter and temporalis muscles were evaluated using a wireless electromyograph, while lip, tongue, and cheek pressures were measured with the Iowa oral pressure instrument. Molar bite force was assessed using a dynamometer, muscle thickness with portable ultrasound, and occlusal force contacts between hemiarches with digital occlusal analysis. Participants' perceptions of snoring, apnea, and bruxism were evaluated through a questionnaire. Statistical analyses included analysis of variance, Bonferroni correction, and Chi-square test ($P < 0.05$). **Results:** Significant differences in normalized electromyographic activity of the masseter and temporalis muscles were noted across groups, with Group I showing higher muscle activation during mandibular tasks and lower bite force. Group I also exhibited slightly lower muscle thickness and significantly higher lip pressure compared to other groups. No significant differences were found in occlusal contacts between hemiarches among the groups. **Conclusion:** Associations were found between groups and sleep disturbances: snoring (moderate), apnea (very weak), and bruxism (weak). In obese individuals, age shapes orofacial functions and sleep disorder perception, with variations in masseter and temporal muscle function, lip pressure, and snoring perception.

Keywords: Age, Functions, Obesity, Orofacial, Sleep disorders, Stomatognathic system

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Introduction

Obesity, characterized by an excess of body fat due to an imbalance between caloric intake and energy expenditure,[1] is a chronic public health issue with a growing prevalence.[2] It not only raises the risk of various health conditions but also impacts orofacial functions, including chewing, swallowing, speech, and breathing, which are controlled by the stomatognathic system.[3,4] Sleep disorders, such as bruxism, apnea, and snoring, are also associated with obesity, as excess weight, especially in the neck area, obstructs the airways and alters metabolism, exacerbating these problems and making weight control more difficult.[5]

Despite studies addressing the influence of obesity on orofacial function, our knowledge of the age-related changes in the morphofunctional patterns of the stomatognathic system is limited. Age is a significant factor to consider, as structural changes due to aging can impact the functional capacity of the human body.[6] As we age, morphological and functional alterations occur in the stomatognathic system.[7] However, specific studies investigating these patterns are scarce and necessary to understand the effects of obesity over the years on orofacial function and related structures.

Aging leads to a loss of elasticity in the soft tissues of the orofacial region, reducing the strength and endurance of the muscles involved in chewing, speech, and facial expressions, thus compromising the function of the human organism. Moreover, aging causes changes in facial fat distribution, resulting in volume loss in certain areas and redistribution in others.[8] These changes can be exacerbated in individuals with obesity, as excessive fat accumulation can negatively affect the distribution of body fat in the systems of the human body,[9] increasing the risk of functional alterations in the stomatognathic system. Therefore, obesity may contribute to the deterioration of aging-related orofacial conditions.[10]

This study aimed to analyze the impact of age on orofacial function and the perception of sleep disorders in obese individuals. Based on scientific principles, the null hypothesis of this study postulates that there is no causal relationship between the age variable and alterations in the morphofunctional functions of the stomatognathic system in obese individuals.

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Materials and Methods

Ethical Approval and Sample

This comparative observational study, using a convenience sample, was conducted in accordance with the ethical principles established by the Ethics Committee of the Faculty of Dentistry at Ribeirão Preto, University of São Paulo, Brazil (Protocol #12160919.0.0000.5419). Informed consent was secured from all individuals. For minors, participation was validated through the signature of the consent form by their legal guardians, along with the child's assent.

A total of 150 individuals were assessed, and finally, 48 were included in the study according to the inclusion and exclusion criteria for participation. All study participants had a complete set of teeth (except Group I—mixed dentition) and were aged 7–40 years, classified as obese based on their age range. They were categorized into three groups: Group I (7–11 years; *n* = 16), Group II (12–20 years; *n* = 16), and Group III (21–40 years; *n* = 16).

The evaluation of the individuals consisted of an anamnestic process performed by a single dental surgeon, who performed a clinical analysis of facial structures, teeth, and overall health using a standardized clinical form. This procedure was designed to collect pertinent information on the individual's personal data, medical and dental history, the presence of systemic diseases, parafunctional habits, and temporomandibular dysfunction. The research diagnostic criteria for temporomandibular disorders (TMD) was adopted as a widely recognized diagnostic criterion for evaluating TMD.

Individuals with missing first permanent molars, both upper and lower, as well as those with dental restorations susceptible to fractures, ulcerations, open wounds, or cutaneous hypersensitivity and with TMD were excluded from the study. Furthermore, individuals with cognitive deficits, neurological pathologies, and uncontrolled systemic diseases were considered ineligible.

The variations in the average values of anthropometric measurements, including weight, height, body mass index (BMI), and body composition (abdominal and neck circumferences), were analyzed between the groups [Table 1]. BMI was calculated as the ratio of body mass to the square of height (kg/m^2). Height was measured using a vertical scale with 0.5 cm increments, whereas abdominal and neck circumferences were measured at the widest points using a non-extensible measuring tape with 0.1 mm increments.

Analysis of Electromyographic (EMG) Activity

The wireless electromyograph TrignoTM Wireless (EMG System, Delsys Inc., Boston, MA, USA) equipped with wireless sensors was used for the analysing the EMG activity of the masseter and temporal muscles. The sensors were placed symmetrically on the skin, covering the masseter, and temporal muscles,[11] following the longitudinal orientation to the muscle fibber identified by digital palpation.

The wireless sensors were placed in accordance with the guidelines established by the surface electromyography for the non-invasive assessment of muscles project.[12] Participants received detailed instructions about the procedure and were asked to maintain a calm posture during data collection.

During the EMG data collection, a rigorous methodological procedure was adopted. This procedure included the execution of the following mandibular tasks: Rest (5 s), protrusion (5 s), right lateral movement (5 s), left lateral movement (5 s), and maximum voluntary dental clenching with (4 s). The data collection for mandibular tasks was performed by a single researcher who was appropriately trained and qualified.

Analysis of Muscle Thickness

Portable ultrasound equipment (Nano Maxx, SonoSite, Inc., Bothell, Washington, USA) equipped with a 13 MHz linear transducer was used to analyze of the masseter and temporal muscle thickness. Ultrasonographic images were acquired during two different mandibular tasks: rest and dental clenching in maximum voluntary contraction.[13] Three ultrasonographic images were captured for each masticatory muscle, with a 2-min interval between measurements, and the average muscle thicknesses were utilized as parameters for analysis.

Analysis of Bite Force

The digital dynamometer IDDK (Kratos-Equipamentos Industriais Ltda., Brazil) was used to record the maximum molar bite force. The device had a thickness of 15 mm and a capacity of up to 1000 N, consisting of two rods equipped with Teflon disks at the ends, where the bite force was applied and recorded.[14]

Data collection started with the dynamometer being inserted into the region of the first permanent molars, both upper and lower, on the right and left sides of the dental arch. During the procedure, the individuals remained seated in a chair, with arms extended along their bodies and hands resting on their thighs.

They were instructed and trained to bite the rods to ensure the reliability of the results. To ensure safety, the tips of the dynamometer were protected with disposable latex finger cots (Wariper, São Paulo, Brazil). Three measurements were taken on each side, with a 2-min interval between each measurement. The highest value of molar bite force was used for statistical calculations.

Table 1: Differences in mean values (±standard error) of anthropometric data and body composition for obese groups

Variable	*Groups*			*P-value*
	I	*II*	*III*	
Age (years)	9.1±0.4	17.7±0.6	25.6±1.1	0.000
Body weight (kg)	55.05±4.87	85.82±4.28	95.35±4.05	0.000
Height (m)	1.44±0.03	1.67±0.02	1.73±0.02	0.000
Body mass index (kg/m^2)	25.57±1.41	30.90±1.48	35.01±3.30	0.01
Abdominal circumference (cm)	80.00±6.17	98.37±3.17	105.81±2.99	0.000
Neck circumference (cm)	28.81±2.18	38.93±0.70	41.75±0.97	0.000

I, group of children. II, group of young. III, group of adults. Kg: Kilograms, m: Meters. kg/m^2, kilograms per square meter. cm, centimeters. Note: *P* values are based on the ANOVA ($P<0.05$)

Analysis of Orofacial Tissue Pressure

The maximum pressure in kilopascal (kPa) exerted by the tongue, lips, and cheeks was measured by the Iowa oral pressure instrument (IOPI) (model 2.3, Medical, Redmond, WA, USA). IOPI detected pressure changes caused by squeezing the plastic bulb against allowing the measurement of maximum pressure during voluntary isometric contraction.[15]

Lip pressure was measured by placing the plastic bulb between the upper and lower lips with the teeth occluded. Participants were instructed to press the bulb for 3 s without drawing it into the oral cavity. For tongue pressure on the palate, the plastic bulb was positioned just behind the upper central incisors, following a standardized placement based on anatomical landmarks, and participants were instructed to elevate the tongue and press the bulb against the hard palate with maximum force for 3 s. Cheek pressure was measured by placing the bulb inside the oral cavity, between the teeth and the cheek in the molar region, and participants were instructed to exert maximum pressure for 3 s. All measurements were taken in triplicate, and the highest value was used for statistical analysis.

Analysis of Occlusal Forces

The analysis of occlusal contact force in the upper and lower hemiarchate, on both the right and left sides, was conducted using the T-Scan digital occlusion analysis system (T-Scan III software, version 8.0.1; Tekscan Inc., Boston, MA). A T-Scan bite sensor, characterized by being thin, flexible, and sensitive to occlusal pressure, was placed in the participants' mouths, and they were instructed to bite with maximum force, corresponding to 95–100% of the total force of occlusal contacts. The positioning guide, located on the T-Scan holder, was adjusted and centered between the upper central incisors.[16]

Analysis of perception of sleep disorders(bruxism, snoring, and apnea).

A questionnaire developed by the researchers was used to assess individuals' perceptions of the presence of sleep disorders such as bruxism, snoring, and apnea. The questionnaire consists of simple yes-or-no questions aimed at identifying possible signs and symptoms associated with these disorders. All individuals completed the questionnaire independently, without any influence or interference from the researchers, ensuring the spontaneity and authenticity of the responses provided.

Statistical Analysis

EMG data were normalized by maximum voluntary dental clenching. Normalized EMG data, masticatory muscle thickness, bite force, orofacial tissue pressure, occlusal forces in hemiarchate, and perception of sleep disorders were organized and processed using IBM Statistical Package for the Social Sciences (SPSS) 22.0 software (IBM SPSS Inc., Chicago, IL, USA). Analysis of variance (ANOVA) and Bonferroni correction tests were applied to demonstrate the significance of the results. For the questionnaires, the Chi-square test was used. $P < 0.05$ was considered statistically significant.

Results

Normalized EMG activity values for each muscle during mandibular tasks in Groups I (obese children), II (obese youth), and III (obese adults) are shown in Table 2. ANOVA revealed significant differences ($P < 0.05$). The left masseter and right temporal muscles in Group I exhibited significantly higher EMG values to Groups II and III.

Greater activation of the right temporal and left masseter muscles was observed during the right lateral mandibular task, following the neuroanatomical pattern of excursive movement across all three groups. Group I showed higher EMG values for right lateral movement, with significant differences in all muscles. The neuroanatomical movement pattern during the left lateral mandibular task, which is characterized by increased activation of the left temporal and right masseter muscles, was not adequately observed in Group I, particularly for the right masseter muscle. There was a significant difference between Groups I and II for the left masseter and right temporal muscles.

During protrusion, the masseter muscles demonstrated higher EMG activity compared to the temporal muscles across all three groups. In Group I, the right masseter and temporal muscles showed significantly higher activation values than those observed in Groups II and III.

Table 2: Differences in mean values (±standard error) of normalized electromyographic activity of the masseter and temporalis muscles in mandibular tasks for obese groups

Mandibular tasks	*Muscles*	*Groups*			*P-value (ANOVA)*	*P-value (Bonferroni)*		
		I	*II*	*III*		*(I) vs (II)*	*(I) vs (III)*	*(II) vs (III)*
Rest	RM	0.18±0.04	0.24±0.19	0.09±0.02	0.63	-	-	-
	LM	0.37±0.14	0.07±0.01	0.10±0.02	0.04	0.05	-	-
	RT	0.19±0.03	0.09±0.01	0.15±0.02	0.04	0.03	-	-
	LT	0.28±0.10	0.10±0.01	0.14±0.02	0.11	-	-	-
Right Laterality	RM	0.29±0.07	0.08±0.02	0.04±0.007	0.006	0.01	0.01	-
	LM	0.41±0.09	0.09±0.01	0.21±0.04	0.002	0.001	-	-
	RT	0.27±0.04	0.14±0.02	0.17±0.03	0.04	0.04	-	-
	LT	0.21±0.04	0.10±0.01	0.15±0.02	0.05	0.05	-	-
Left Laterality	RM	0.39±0.07	0.13±0.05	0.25±0.12	0.11	-	-	-
	LM	0.40±0.10	0.09±0.02	0.13±0.02	0.003	0.05	-	-
	RT	0.26±0.08	0.08±0.00	0.13±0.02	0.04	0.05	-	-
	LT	0.29±0.05	0.15±0.01	0.24±0.04	0.08	-	-	-
Protrusion	RM	0.59±0.11	0.24±0.08	0.38±0.10	0.06	-	-	-
	LM	0.68±0.15	0.15±0.02	0.31±0.08	0.03	0.003	0.05	-
	RT	0.28±0.06	0.10±0.01	0.13±0.02	0.008	0.01	0.04	-
	LT	0.21±0.03	0.10±0.01	0.16±0.03	0.04	0.03	-	-

I, group of children. II, group of young. III, group of adults. RM: Right masseter, LM: Left masseter, RT: Right temporal, LT: Left temporal. Note: Dashes indicate no difference. *P* values are based on the ANOVA and Bonferroni correction ($P<0.05$)

Table 3 shows the values for maximum molar bite force, masticatory muscle thickness, orofacial tissue pressure, and occlusal forces in hemiarchate in the three groups. The results testing revealed that Group I had significantly lower maximal molar bite forces than the other two groups. A significant gradual increase in the masseter and temporal muscle thickness was observed in Groups I to III during rest and dental clenching in maximum voluntary contraction. Group I demonstrated higher pressure on the lips than did Group II and Group III, and this difference was significant. There were no significant differences observed in the occlusal contacts of the right and left hemi-arches between the groups.

Table 4 presents the percentage values of the presence of snoring, sleep apnea, and bruxism among the three groups. Cramer's V values showed different levels of association between conditions and groups: snoring showed a moderate association, whereas apnea had a very weak association. Bruxism exhibited a weak association with the three groups.

Discussion

Due to the causal relationship between age and the observed changes in the morphofunctional functions of the stomatognathic system in obese individuals, the null hypothesis of this study was rejected. The mandibular rest task performed in this study showed that temporal muscles exhibited higher normalized EMG activity than masseter muscles in all three groups. Furthermore, Group I, composed of obese children, showed higher significant values of normalized EMG activity for the right masseter and left temporal muscles than the other two groups.

The difference in normalized EMG activity between the temporal and masseter muscles in the studied groups might be attributed to different factors. Temporal muscles may be more active due to the need for greater force to elevate the mandible through the anterior and middle fibers during oral activities such as chewing.[17] This increased activity of the temporal muscles could compensate for the modified orofacial characteristics in obese individuals.[18] The relationship between the muscular activity of these muscles should be taken into consideration, as this association can vary depending on the age, BMI, and muscular composition of each individual. These factors could impact the biomechanics of the stomatognathic system and, consequently, the muscular activity during rest.

The higher normalized EMG activity in the masticatory muscles in Group I can also be attributed to age-related physiological differences and muscular development. The stomatognathic system, which includes the muscles of mastication, undergoes continuous growth and development during childhood.[19] These muscles undergo adaptation and refinement as the child grows and acquires more robust motor skills.

In obese children, obesity-related characteristics, such as changes in adipose tissue, body composition, and metabolic factors, can influence muscular development.[20] Obese children may also present with insulin resistance, systemic inflammation, and mitochondrial abnormalities, which can affect muscular metabolism and neuromuscular function.[21] These alterations could lead to an increase in the EMG activity of the masticatory muscles as an adaptive response.

Greater activation of the right temporal muscle and the left masseter muscle was observed during the right lateral movement, following the neuroanatomical pattern of the mandibular lateral excursive movement in all three age groups. These findings can be explained by the specific characteristics of the function of the masticatory muscles and the neural organization involved in the mandibular lateral movement.[22]

Regarding the differences between the groups, Group I, composed of obese children, showed greater EMG activation during the right lateral movement. This difference can be attributed to factors such as muscle development during

Table 3: Differences in mean values (± standard error) of bite force, muscle thickness, pressure of orofacial tissues and occlusal contact force for obese groups

Variables	*Groups*			*P-value (ANOVA)*	*P-value (Bonferroni)*		
	I	*II*	*III*		*(I) vs (II)*	*(I) vs (III)*	*(II) vs (III)*
Bite force (*n*)							
Right	245.3±25.9	434.8±43.9	506.1±51.4	0.000	0.008	-	0.000
Left	240.6±30.8	407.7±31.1	502.7±53.1	0.000	0.01	0.000	-
Muscle thickness (cm)							
Rest							
RM	0.77±0.01	0.80±0.03	0.94±0.03	0.000	-	0.000	0.002
LM	1.03±0.06	1.39±0.04	1.41±0.06	0.000	0.000	0.000	-
RT	0.29±0.00	0.35±0.01	0.36±0.00	0.000	0 0.000	0.000	-
LT	0.40±0.10	0.47±0.02	0.48±0.01	0.09	-	-	-
MVC							
RM	0.78±0.05	0.81±0.02	0.96±0.05	0.01	-	0.02	-
LM	1.15±0.04	1.40±0.04	1.52±0.05	0.00	0.001	0.000	-
RT	0.32±0.01	0.34±0.00	0.38±0.01	0.00	-	0.007	-
LT	0.41±0.01	0.48±0.01	0.50±0.01	0.00	0.006	0.000	-
Orofacial pressure (kPa)							
Tongue	33.50±3.92	46.75±4.81	44.85±5.05	0.10	-	-	-
Lip	21.62±2.84	11.75±2.27	13.60±2.47	0.02	0.02	-	-
Cheek	11.68±1.33	10.37±1.73	17.06±4.73	0.26	-	-	-
Occlusal contact force (%)							
Hemiarchate (right side)	50.88±3.42	52.55±3.38	53.26±2.98	0.87	-	-	-
Hemiarchate (left side)	49.11±3.42	49.50±2.75	51.85±3.06	0.79	-	-	-

I, group of children. II, group of young. III, group of adults. N: Newtons, cm: Centimeters, kPa: Quilopascal, %: Percentages, RM: Right masseter, LM: Left masseter, RT: Right temporal, LT: Left temporal, MVC: Dental clenching in maximum voluntary contraction, ANOVA: Analysis of variance. Note: Dashes indicate no difference. *P* values are based on the ANOVA and Bonferroni correction ($P<0.05$)

Table 4: Perception of snoring, sleep apnea, and bruxism for obese groups

Sleep disorders	*Groups*			*Total*	*Cramer's V*	*P-value*
	I	*II*	*III*			
Snoring						
Yes						
n	1	7	6	14	0.36	0.04
%	7.1	50.0	42.9	100		
No						
n	15	9	10	34		
%	44.1	26.5	29.4	100		
Apnea						
Yes						
n	1	2	2	5	0.09	0.80
%	20	20	40	100		
No						
n	15	14	14	43		
%	34.9	32.6	32.6	100		
Bruxism						
Yes						
n	3	2	6	11	0.21	0.21
%	27.3	18.2	54.5	100		
No						
n	13	14	10	37		
%	35.1	37.8	27.0	100		

I, group of children. II, group of young. III, group of adults. Note: *P* values are based on the Chi-square test ($P<0.05$)

growth and the possible adaptation of the masticatory system to obesity in childhood. Obese children may have specific characteristics of muscular composition and development, including greater muscle mass or distinct muscle proportions.[23] These characteristics can lead to greater activity of the masticatory muscles, than in the obese youth and adult groups. Meanwhile, no significant differences in muscle activation during mandibular lateral movement were observed between Groups II (obese youth) and III (obese adults), indicating that, after childhood, variations in muscular development and obesity-related physiological adaptations may stabilize.

The expected neuroanatomical pattern during left lateral movement involves greater activation of the left temporal muscle and the right masseter muscle.[24] However, this activation was not adequately observed in Group I. Differences in muscle activation during left lateral movement in age groups with obesity can be explained by muscular development in younger individuals and neuromuscular coordination in older groups. Changes in muscular development can result in different activation patterns, while inadequate neuromuscular coordination can lead to unexpected muscle activation.[25] Moreover, obesity is related to changes in the nervous system, including motor neuron dysfunction and coordination control Centers, affecting neural signal transmission and proper muscle activation during movement.[26]

During protrusion, the masseter muscles exhibited higher normalized EMG activity than the temporal muscles in the three groups. This can be explained by the primary function of the masseter muscles, which is to elevate the mandible and contribute to the force of jaw closure during chewing and other related activities.[25] Consequently, compared to the temporal muscles, masseter muscles tend to be more activated during protrusion, which is primarily involved in jaw-opening movements. This difference in muscle activation reflects the biomechanical importance of the masseter muscles in chewing and dental occlusion.

The masseter and temporal muscles in Group I, which included obese children, exhibited greater muscular activation during protrusion than those in Groups II and III. These differences can be explained by the more active stage of muscular development observed in obese children, who have a higher proportion of active muscle fibers and a greater muscular recruitment capacity. Therefore, this leads to increased muscular activation during the mandibular protrusion task, influenced by the imbalance in the distribution of muscle fibers and changes in the proportion of type I and type II fibers.[26] Furthermore, the composition of muscle fibers may differ between the three groups. For instance, Group I, composed of obese children, has a higher proportion of type II muscle fibers, which can generate force rapidly, resulting in higher values of muscular activation.[27]

The lower maximum molar bite force in Group I compared to the other groups can be attributed to several factors, including age, inadequate muscular development, the influence of obesity on muscular function, and possible structural modifications of the jaw and dental occlusion.[28] A higher percentage of body fat in obese children can impair muscular function and reduce the ability to generate force in the stomatognathic system, thereby affecting the chewing process.[10]

Based on our findings, the gradual increase in the masseter and temporal muscle thickness in Groups I to III during mandibular rest and maximum clenching may be influenced by obesity. Obesity is associated with an increased accumulation of adipose tissue throughout the body, including the facial region.[29] Accumulation of adipose tissue can exert pressure and additional load on the masticatory muscles, leading to increased muscle activity and, consequently, increased muscle thickness,[30] as observed in our study.

Furthermore, obesity is related to metabolic and hormonal alterations that can influence muscular development and overall muscle function.[31] These changes can compromise the force-generating capacity of the muscles involved in chewing and contribute to the observed increase in muscle thickness in groups of obese individuals. However, factors other than obesity may also contribute to the increase in muscle thickness, such as physical activity, genetics, and participants' age. Therefore, the relationship between obesity and increased of the masseter and temporal muscle thickness requires further investigation to fully understand the underlying mechanisms.

The results revealed significant differences in lip pressure between age groups. Group I had significantly higher lip pressure than Groups II and III. Obese children adopt compensatory strategies to cope with obesity,[32] which may include increased muscle activity of orofacial muscles, such as the lips, during speech, eating and other daily activities, thus explaining the association between childhood obesity and higher lip pressure compared to obese young and adult individuals. This additional effort may lead to higher lip pressure during the IOPI examination.

Analyzing data from obese individuals across different age groups, no differences were found in the percentage distribution of occlusal force between the maxilla and mandible. The results showed that, despite variations in weight and age, occlusal force values were quite similar, indicating that the distribution of occlusal force did not vary between the groups. This suggests that, even with differences in weight and age, the distribution of occlusal contacts and the force applied to the occlusal surfaces remain consistently similar.[16]

The study revealed a moderate association between snoring and obesity, influenced by age-related physiological factors. Obesity can increase fat deposition in the upper airways, such as the pharynx and larynx, leading to partial airway obstruction and tissue vibration, which causes snoring.[33] This obstruction may vary in severity across age groups due to differences in fat distribution and tissue elasticity. In children and adolescents, snoring may relate to airway growth and development patterns, whereas in adults, fat accumulation and changes in airway muscle tone contribute to increased snoring severity.[34] Therefore, the moderate association reflects how obesity interacts with anatomical and physiological factors at different life stages, impacting the severity and frequency of snoring.

This study had some limitations. First, the sample size was small, with only 16 individuals per group, which may affect the generalizability of the results to a broader population. Using larger samples for a more comprehensive understanding of the characteristics and patterns of the stomatognathic system in different age groups would be recommended. Second, the selection of participants based on specific criteria, such as complete dentition, obesity, and an age range between 7 and 40 years, may limit the representativeness of the sample by excluding people with tooth loss or older age groups. Therefore, the results may not apply to other groups. Finally, the study does not mention whether other relevant variables, such as physical activity and diet, were consistently controlled or evaluated, which can influence the functions of the stomatognathic system. All the factors mentioned in the limitations of this study should be considered for a more comprehensive analysis of the influence of obesity on the stomatognathic system.

Conclusion

The findings of this study demonstrated that age in obese individuals determines changes in orofacial functions and perception of sleep disorders, with differences in the morphofunctionality of the masseter and temporal muscles, lip pressure, and snoring perception. Further research is needed to validate these observations in various clinical settings.

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