ORIGINAL ARTICLE

EATING HABITS, CHEWING PATTERN, AND ANTHROPOMETRIC CHARACTERISTICS OF INDIVIDUALS WITH TEMPOROMANDIBULAR DISORDER

Ligia Patron Witwytzkyj[1], Graziela Mackowiesky Brigido Bernardo[2]
Murilo Kazuo Iwassake[3], Fabiane Miron Stefani [4]

Highlights: (1) Individuals with temporomandibular disorder tend to opt more frequently for foods that are easier to chew. (2) Maximum mouth opening and mandibular laterality measurement were found to be smaller in this group (3) Alternating bilateral chewing was predominant in both groups. (4) Only the group with temporomandibular disorder recorded occurrences of chronic unilateral chewing.

http://dx.doi.org/10.21527/2176-7114.2026.51.16844

How to cite:
Witwytzkyj LP, Bernardo GMB, Iwassake MK, Stefani FM. Dietary habits, chewing pattern, and anthropometric characteristics of individuals with temporomandibular disorder. Rev. Contexto & Saúde. 2026;26(51):e16844

[1] Federal University of Santa Catarina (UFSC). Florianópolis/SC, Brazil.
https://orcid.org/0000-0002-0399-4536
[2] Federal University of Santa Catarina (UFSC). Florianópolis/SC, Brazil.
https://orcid.org/0000-0001-8183-7838
[3] Federal University of Santa Catarina (UFSC). Florianópolis/SC, Brazil.
https://orcid.org/0000-0003-1422-2141
[4] Federal University of Santa Catarina (UFSC). Florianópolis/SC, Brazil.
https://orcid.org/0000-0002-8531-6594

EATING HABITS, CHEWING PATTERN, AND ANTHROPOMETRIC CHARACTERISTICS OF INDIVIDUALS WITH TEMPOROMANDIBULAR DISORDER

ABSTRACT

Objective: To describe the eating habits and the consistencies of the food consumed, relating them to facial anthropometry and masticatory characteristics of the individuals diagnosed with temporomandibular disorder compared to a control group. Method: The study included 40 individuals who answered an online questionnaire. After applying the inclusion and exclusion criteria, the individuals were called for a clinical evaluation. For the dental evaluation we used the DC/TMD protocol, while in the speech evaluation we used parts of the MBGR protocol. Data on facial anthropometry, mandibular movement measurements, and masticatory function were collected. The sample was divided, for purpose of assessment, into a control group and a group with temporomandibular disorder. **Results:** Participants in the group with temporomandibular disorder classified some foods as harder to chew than those in the control group (p=0.043). The group with temporomandibular disorder presented smaller mouth opening, reduced mandibular laterality, and greater vertical dimension of occlusion. Both groups predominantly used alternating bilateral chewing (control group: 80% and temporomandibular disorder group: 75%), but only the temporomandibular disorder group presented chronic unilateral chewing (20%), besides showing more alterations in their orofacial motor skills. **Conclusion:** Temporomandibular disorder can influence certain eating habits. The preference for softer food consistencies is possibly related to an attempt to minimize chewing discomfort, which, in turn, can contribute to muscular and functional alterations. Thus, the data enhance the importance of considering eating-related behaviors to be associated to the patient's complaint.

Keywords: Eating Behavior. Chewing. Anthropometric Assessment. Speech Therapy. Temporomandibular Joint Disorders.

1 INTRODUCTION

Chewing is a sensorimotor function that depends on the proper development, integrity, and functioning of the orofacial structures to ensure the efficiency of the function (1). Depending on the characteristics of the foods that the individual usually consumes (size, texture, and consistency), chewing patterns are learned and influence the balance of teeth, facial bones, and muscle mobility (2). Hence, eating habits are defined as the frequent repetition of

an act or custom related to eating (3), and when this is modified, the physiological pattern of chewing may be altered (4).

The desirable physiological pattern of chewing is bilateral alternating chewing, and this depends on the functional capacity of the temporomandibular joints (TMJs), the masticatory muscles, ligaments, bone structures, occlusion, and the movement of the tongue, lips, and mandible (5, 6).

Temporomandibular disorders (TMDs) are part of a group of alterations that affect the temporomandibular joints (TMJs), the masticatory muscles, and associated structures. This disorder has an estimated prevalence of 5% to 12% in the general population (7).

Difficulty in swallowing hard foods and fatigue after chewing in individuals with TMDs has been evidenced in the literature (5). According to Tomé (8), difficulty chewing affects food choices, which can lead individuals to make inappropriate choices regarding their diet and generate environmental/phenotypic influence on the development of bones and muscles that depends on the eating habits. If chewing is deficient in terms of consistency and of chewing quality, facial asymmetries may occur (9).

Asymmetries in the face can be measured by the clinician using orofacial anthropometry, which aims to make an objective and quantitative measurement of the facial sizes and proportions, increasing the accuracy of the diagnosis and helping in the prognosis of the case (10).

Therefore, the objective of this study was to describe the eating habits and the consistency of the food consumed, relating them to facial anthropometry and to the chewing characteristics of individuals diagnosed with temporomandibular disorder compared to a control group.

2 METHODOLOGY

This study adopted a descriptive observational cross-sectional design using a non-probabilistic sample. This project was submitted to and approved by the Ethics Committee for Research in Humans under opinion number 5.647.333, CAAE 62918222.8.0000.0121.

The call to participate in the data collection was randomly distributed online through the WhatsApp, Facebook, and Instagram groups, describing the objectives and inclusion criteria, and providing a link that directed the stakeholders to an online questionnaire. The questionnaire was closed for further responses when the same number of eligible respondents was reached in both the study and the control groups.

The survey instrument for Phase I was a Google Forms questionnaire composed of 74 questions that included anthropometric data, symptoms suggestive of TMD, medication use, dental conditions, eating habits, classification of the listed foods consistency, and interest in participating in Phase II, which would involve an in-person speech-language pathology and dental clinical evaluation. The data collected from the online form were used as inclusion/exclusion criteria in the clinical research. Only the data on eating habits and food classification were subsequently assessed in this study.

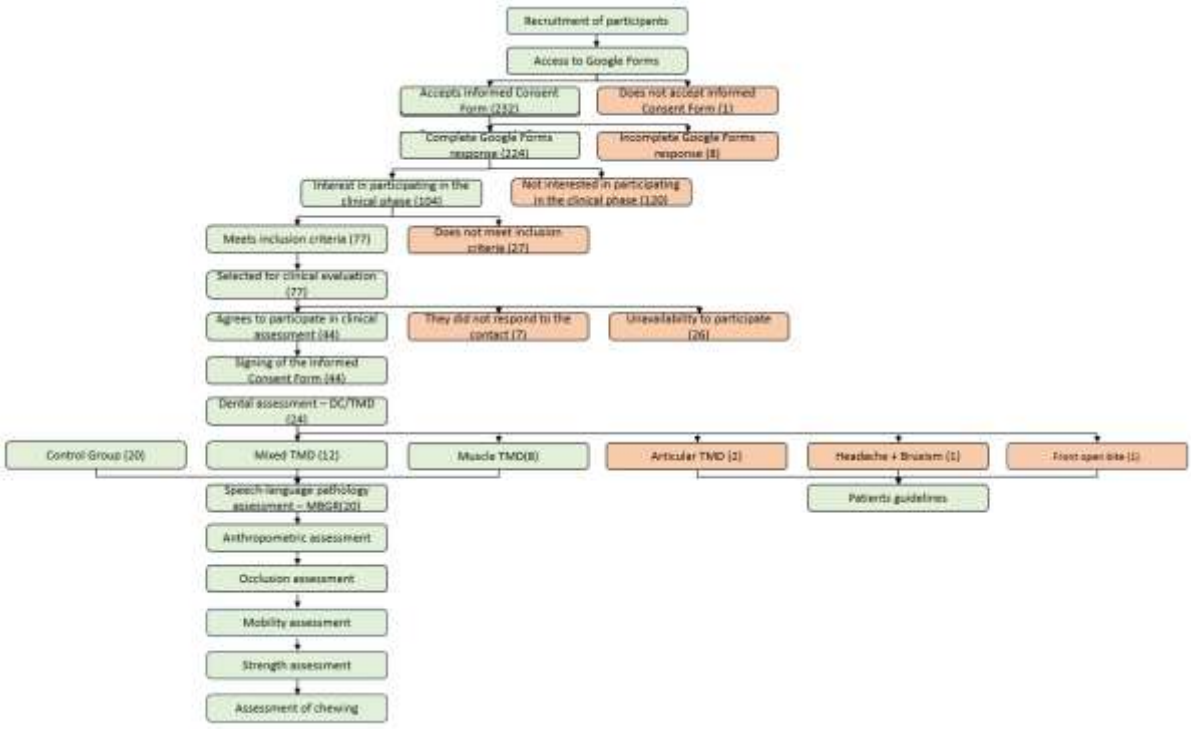
The study included adults aged 18 to 50 years old residing in the Greater Florianópolis region, Santa Catarina State, between March 2022 and March 2024. Individuals with self-reported neurological or motor impairments, those using muscle relaxants or medications that cause xerostomia, those using complete or partial dentures, or those with missing teeth in occlusal pairs and/or more than three missing teeth were excluded. Individuals who had undergone treatment for TMD in the last 6 months were also not admitted in the study. All participants signed the Informed Consent Form.

In the clinical assessment, individuals initially received information about the study's objective and methods and signed a new Informed Consent Form authorizing indicating their consent in participating in the second phase of the clinical research. Subsequently, they were seen by a specialist dentist who used the Axis I form of the DC/TMD assessment protocol (7) to define the type of TMD, including only individuals diagnosed with muscular TMD and mixed TMD. The speech-language pathology assessment was performed based on the MBGR

protocol (11), in which facial anthropometry, mandibular movements, dental occlusion, tone, and mobility of the orofacial musculature were assessed. Measurements were taken with a Cosa digital caliper and a digital outside caliper, using millimeters (mm) as the unit of measurement.

Finally, the chewing assessment was filmed using a digital camera mounted on a tripod positioned on a table in front of the sitting participant, at a distance of 30 centimeters. The participant was instructed to sit with adequate foot support and without head support in order not to restrict his movements during the assessment, and to chew three portions of a 2-cm thick central slice of French bread (from the same bakery); the participants received the following instruction: *"I'm going to film you while you eat three bites of this French bread. Take the slice and eat as usual. I want you to keep your head straight looking directly at the camera."* The speech-language pathology assessment was performed by one of the two speech-language pathologists trained to collect data.

The MBGR chewing assessment videos were analyzed by three blinded judges, speech-language pathologists specializing in orofacial motor skills, using a protocol developed by the authors based on the MBGR chewing assessment protocol.



Legend: FICF = Free and Informed Consent Form; TMD = Temporomandibular disorder; MBGR = Protocol of orofacial myofunctional evaluation; DC/TMD = Diagnostic criteria for temporomandibular disorder

Figure 1. Data collection flowchart

The sample composition was formed using a convenience sampling approach, consisting of participants who completed the questionnaire, agreed to participate, attended the in-person assessment, and met the study's inclusion criteria, thus characterizing a non-probabilistic sample.

For the qualitative variables in the sample, the data were represented by absolute (n) and relative (%) frequencies. Additionally, for some variables, 95% Confidence Intervals (95% CI) were presented. The quantitative variables were described using measures of central tendency and dispersion: mean, standard deviation (SD), median, and Interquartile Range (IQR) (p25-p75).

Quantitative variables were tested for normality using the Shapiro-Wilk test. When a normal distribution was found, the parametric Student's t-test was used (for comparison of two groups). In the absence of normality, the Mann-Whitney test was used (for comparison of two groups). For comparison of three or more groups, the Kruskal-Wallis test (non-parametric) was

used. To assess the relationship between two qualitative variables, the Fisher's exact test was used.

The three judges who volunteered to assess the video files were to evaluate, among other things, the classification of chewing process and the chewing pattern. The classification of chewing was evaluated using two response options: adequate and altered. Regarding the chewing pattern, this evaluation had five evaluative options: alternating bilateral; preferential unilateral R; preferential unilateral L; simultaneous bilateral and chronic unilateral, which were classified, as instructed in the MBGR protocol, evaluating the rate of chewing strokes/cycles in relation to the total number of chewing strokes/cycles To assess the agreement between the judges, Fleiss' Kappa statistical test was used; this test indicates the degree of agreement between three or more judges, generally indicated for nominal or ordinal evaluations. For the interpretation of the values obtained, 12 parameters were used that indicate: 0 to 0.20: very weak agreement; 0.21 to 0.40: weak agreement; 0.41 to 0.60: moderate agreement; 0.61 to 0.80: good agreement; 0.81 to 1.00: very good agreement.

The data were stored in Microsoft Excel spreadsheets and subsequently exported to the Stata software version 14.0 (https://www.stata.com). IBM SPSS 25 software was used for the concordance analysis. A significance level of 5% ($p<0.05$) was considered.

3 RESULTS

The online questionnaire was fully completed by 224 respondents, of whom only 104 expressed interest in participating in Stage II of the clinical evaluation. Their responses were screened through the inclusion and exclusion criteria, and 77 individuals were found eligible to participate in Stage II of the investigation. Only the questionnaire responses regarding eating habits and food consistencies of individuals who attended the clinical evaluation and completed their participation in the study were analyzed. The study included 20 individuals from the temporomandibular disorder group (TMDG) and 20 from the control group (CG) (n=40), the majority of whom were female (80%) (95% CI: 64.0; 89.9) and in the 20-29 age range (50.0%) (95% CI: 34.3; 65.6). The mean age for the total sample was 31.2 years (95% CI: 28.9; 33.6) (SD=7.3). There was no statistically significant difference between the control group (CG) and the group with mixed TMD in relation to gender (p=0.235), age range (p=1.000), and

continuous age (p=0.509). In this sample, after evaluation by the dentist and the speech-language pathologists, 12 individuals were classified with mixed TMD and 8 with muscular TMD.

Regarding the questionnaire, the responses related to eating habits did not show a significant difference in the "breakfast," "afternoon snack," and "lunch" meals, but a significant difference was observed in the "dinner" meal (p=0.004). Even in the meals where no statistical differences were observed, we could identify distinct consumption rates between the groups, as shown in the following table:

Table 1 - Foods most consumed by the study participants at breakfast and at afternoon snack. Grande Florianópolis, 2023.

Snack	Most consumed foods	CG	TMDG	p value*
BREAKFAST	Fruits	60%	85%	0.113
	Sliced bread/loaf of bread	60%	95%	
	French bread/roll/wheat bread	50%	50%	
LUNCH	Roast chicken/Chicken fillet (grilled/breaded)	55%	65%	0.093
	White rice	65%	70%	
	Beans/Lentils	65%	75%	
	Pasta	40%	65%	
	Tomato	60%	75%	
	Lettuce/Raw kale/Spinach	40%	85%	
	Shredded beef or ground beef	35%	70%	
	Broccoli/Cauliflower	45%	75%	
	Stewed beef/Pot roast	35%	80%	
AFTERNOON COFFEE	Fruits	60%	90%	0.33
	Sliced bread/loaf of bread	65%	85%	
	French bread/roll/wheat bread	35%	25%	
DINNER	Roast chicken/Chicken fillet (grilled/breaded)	40%	65%	0.004
	White rice	35%	60%	
	Tomato	25%	60%	
	Lettuce/Raw kale/Spinach	20%	60%	
	Shredded meat or ground meat	45%	65%	
	Omelet	55%	65%	

Legend: CG = Control group; TMDG = temporomandibular disorder group.
* Fisher's Exact Test.

Fifty-two foods were offered for consistency classification, and for the most part, both groups classified the foods that had the same consistency option (Soft, Medium, Hard). Only for some foods a significant difference regarding consistency between the groups was found: Roasted chicken/Chicken fillet (grilled/breaded) (CG: Medium, TMDG: Soft/Medium, p<0.001), cashew nuts (CG: Medium/Hard and TMDG: Hard, p=0.011) and walnuts (CG: Medium/Hard and TMDG: Hard, p<0.038). It is also noteworthy that the TMD group classified

some foods as more consistent compared to the CG (Filled biscuit/cookie (CG: Medium and TMDG: Medium/Hard), Breakfast cereal - granola (CG: Medium and TMDG: Hard), Industrialized breakfast cereal or oatmeal with milk (CG: Soft and TMDG: Medium), Green corn (CG: Medium and TMDG: Hard), Cashew nuts (CG: Medium and TMDG: Hard) and Walnuts (CG: Medium and TMDG: Hard); thus there was a statistically significant difference in the assessment between the groups (p= 0.043). concerning the "hard" consistency classification.

Table 2 shows the p-value relative to the comparison of food consistency classification made by each group.

Table 2 Comparison of the consistency rating assigned to foods by the participants in the CG and TMDG groups based on the list presented in the online questionnaire. Grande Florianópolis, 2023.

Classification of food consistencies between the TMDG and CG	p* value
Soft	0.931
Medium	0.225
Hard	0.043

Legend: CG = Control group; TMDG = temporomandibular disorder group.
* Fisher's Exact Test.

Regarding the chewing pattern, bilateral chewing was more frequent in both the CG (80.0%) and the TMDG (75.0%). A higher proportion of left-leaning unilateral chewing patterns were observed in the CG (15.0%) compared to the TMDG (5.0%). These differences were not statistically significant (p=0.118). In the TMDG, 20% of the individuals were categorized as having chronic unilateral chewing, while the CG had no individuals with such classification.

Table 3 Description of the chewing pattern according to the study groups. Grande Florianópolis, 2023.

Variable	Total sample		CG		TMDG		p-value
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	
Alternating/simultaneous bilateral	31	77.5 (61.3-88.2)	16	80.0 (54.6-93.0)	15	75.0 (49.7-90.0)	0,118*
Unilateral preferential R	1	2.5 (0.3-17.0)	1	5.0 (0.6-30.7)	-	-	
Unilateral preferential L	4	10.0 (3.6-24.6)	3	15.0 (4.6-39.3)	1	5.0 (0.6-30.7)	
Chronic unilateral	4	10.0 (3.6-24.6)	-	-	4	20.0 (7.3-44.4)	

Legend: CG = Control group; TMDG = temporomandibular disorder group.
95% CI = 95% Confidence Interval; R = Right; L = Left.
* Fisher's Exact Test.

Although the groups did not reveal significant differences in their chewing patterns, food consistency classification, or eating habits, some differences were observed between them which demonstrated a different frequency of consumption in their eating habits. It is important to highlight that most of the foods consumed by both groups were classified as soft.

In the orofacial myofunctional assessment, despite the variation found, no statistically significant difference was identified for mobility and occlusion. However, in the muscle tone assessment, a p-value <0.05 was found, showing a difference between the groups and evidencing a greater number of altered assessments in the TMDG group. It is important to emphasize that the TMD group presented a greater number of alterations in all three variables.

No statistically significant difference was observed in chewing time for the food used in this study (a 2 cm slice of the central portion of French bread); however, the TMD group showed a longer average chewing time in seconds (CG: 57.78s and TMDG: 63.80s). Comparing the number of chewing cycles performed by the individuals, an average of 22.38 (SD = 17.44) chewing strokes was found for the CG group and 22.57 (SD = 12.71) for the TMD group, revealing a balance between the groups, again without statistical significance.

Table 4 Comparison of the preferred side of the masticatory cycles and mandibular laterality. Grande Florianópolis, 2023.

	Masticatory cycles			Mandibular laterality	
	Average % total of cycles to R	Average % total of cycles to L	Average % total of cycles to R and L	Mid-lateral mandibular R (mm)	Mid-lateral mandibular L (mm)
CG	43.80%	29.84%	26%	9.5	8.1
TMDG	36.96%	35.14%	28%	7.5	7.6

Legend: R= Right; L= Left.
CG = Control group; TMDG = temporomandibular disorder group.
% = Percentage.
Mm = Millimeters.

Table 4 shows that masticatory cycles and mandibular laterality differed between groups, but this difference was not reflected within the groups. It can be concluded, therefore, that the Control group presented the highest average rate of total cycles to the right (43.80%) and also had the highest average measurement of mandibular laterality to the right (9.5 mm). Regarding the TMD group, we observe that it presents a similar average rate of total cycles to the right and left (36.96 and 35.14%), as well as a similar measurement of mandibular laterality to the right and left (7.5 mm and 7.6 mm, respectively).

Regarding the anthropometric evaluation of the face (measurements from the outer corner of the eye to the lip right and left commissure, vertical dimension of occlusion, mandibular laterality, and mouth opening), no statistically significant differences were observed between the study groups. Despite this, the Control group showed higher average values in almost all measurements, notably the maximum mouth opening value (CG: 50.2 mm and TMDG: 46.9 mm). The exception was the vertical dimension of occlusion measurement, where the TMDG group showed higher values (average = 59.8 mm for the Control group and 62.0 mm for the TMD group).

With regard to the facial anthropometry measurements and the masticatory pattern of each group, higher median values were observed in the line from the outer corner of the right eye to the lip right commissure among the individuals with a left-preferential unilateral masticatory pattern between the CG (73.5 mm; p=0.329) and the TMDG (70.5 mm; p=0.750), although without statistically significant differences in the distributions. Furthermore, the values of the line from the outer corner of the left eye to the lip left commissure were higher

among the individuals with an alternating bilateral masticatory pattern between the Control group (71.0 mm; p=0.280), while between the TMDG the median was higher among those with a left-preferential unilateral pattern (70.5 mm; p=0.622), although without statistical significance.

No statistically significant difference was observed in the distribution of the vertical dimension of occlusion (VDO) measurements between the masticatory pattern types for both groups. The control group showed higher median VDO values among the individuals with a simultaneous/alternating bilateral masticatory pattern (59.0 mm; p=0.538), while the TMDG showed higher values for the individuals with a chronic unilateral masticatory pattern (61.9 mm; p=0.264).

Regarding the assessment of agreement between the judges, it is observed that among the CG, there was very good agreement among the judges regarding the chewing classification both in general (kappa=0.863), and for the categories "adequate" (kappa=0.863) and "altered" (kappa=0.863). For the TMDG, there was good overall agreement among the judges regarding the chewing classification (kappa=0.777). For the classification of the chewing pattern, in both groups the overall agreement among the judges was good (kappa=0.680 for the CG and kappa=0.649 for the TMDG), highlighting maximum agreement (very good) among the judges regarding the classification of the right preferential unilateral chewing pattern (kappa=1.000) among the CG and left preferential unilateral among the TMDG individuals (kappa=1.000). Moderate agreement was found in the classification of the left-preferential unilateral chewing pattern (kappa=0.567) among the CG individuals and in the classification of the alternating bilateral chewing pattern (kappa=0.529) among the TMDG individuals.

4 DISCUSSION

This study's population consisted of adults, with an average age of 31.2 years, the majority being female. This group is consistent with the indications in the literature regarding the prevalence of TMD among people aged between 20 and 50 years among which women have a higher probability of developing TMD (13).

We found in this study that there is no great variation in food consumption options; however, it is noticeable that the TMD group seems to seek options of food that is easier to

chew (soft), such as sliced bread whose consumption is significantly higher compared to French rolls/wheat bread. Fruit consumption at breakfast was high in both groups, but it is unknown how the fruit is prepared for consumption (whole, chopped, mashed, cooked). Regarding meat consumption, the TMD group clearly prefers ground or cooked meat. Vegetables had a high consumption rate in the TMD group, higher than in the Control group. As to the eating habits, no restriction regarding food groups was identified in the TMDG diet, a fact that the literature indicates as being common (14). Even so, the difference in the food consistency observed in the most chosen items in the dietary habits of the TMDG group may contribute to the alterations observed in our study in the orofacial motor skills assessment of this part of the population. Melchior, Magri, Mazzetto (15) have enhanced the occurrence of orofacial motor alterations in patients diagnosed with TMD.

Regarding the food consistency the TMDG classified some foods such as Brazil nuts, cashew nuts, and walnuts as being harder than what the CG assessment indicated with statistical significance, but most foods obtained the same consistency classification in both groups, or else the CG classified them as being softer than the TMDG's assessment. Observing the foods most consumed in dietary habits and relating them to the consistency classification assigned to them, both groups predominantly opted for the consumption of soft foods. Food selection is a dynamic process and is influenced by biological, sociocultural, anthropological, economic, and psychological factors (15). Personal characteristics, such as chewing comfort, can also shape each individual's food choice (16). As to the classification of food consistency, we emphasize that the classification choices that each individual makes depend on their previous experiences, and it is assumed that some individuals may have classified the consistency of a food by comparing it to another. The literature indicates that there may be a tendency for the development of food preferences associated with the contexts and consequences of food intake (17).

In this study, the TMD group experienced a longer chewing time than the Control group, although without statistical significance. The number of masticatory cycles was similar for both groups, which differs from what is found in the literature, where an increased masticatory cycle is observed in individuals with TMD (18). Similarly, Ferreira et al. (5) also found no difference between TMDG and CG in relation to masticatory frequency. However,

although the number of masticatory cycles was similar for both groups, the masticatory time was longer for the TMDG; it is assumed that the masticatory efficiency of the Control group was greater. Likewise, in another study a longer chewing time for individuals with TMD was observed (5). Felício et al. (19) performed a masticatory assessment in individuals with TMD and asymptomatic individuals and found a longer chewing time and also a greater number of masticatory strokes in individuals with TMD. These authors state that the greater number of occlusal alterations found in individuals with TMD may impair masticatory performance, thus increasing the time of such function.

It is observed that most of the sample participants in this study presented bilateral chewing, in which both sides of the mouth are used alternately (20) and, considering the facial anthropometry and focusing on the measurement from the outer corner of the eye to the lip commissure, it was possible to observe that there was no significant difference between the sides of the face of those who chew bilaterally, thus suggesting facial symmetry in the individuals in this part of the sample. Further regarding chewing types, it is noteworthy that among the other chewing classifications presented by the individuals in this study, only in the TMD group was chronic unilateral chewing observed, with 20% of the individuals in this group chewing in this way (10% of the total sample). Chewing is classified as chronic unilateral when more than 75% of the chewing cycles occur on the same side (21). This chewing pattern can result in harm to the body, since it does not provide adequate bilateral stimuli to the facial muscles and the TMJ, causing the individual to become more susceptible to developing TMD (22). Ferreira et al. (5), state that individuals with TMD have a higher frequency of unilateral chewing pattern. Another study also found alternating bilateral chewing pattern in the majority of the sample participants, but when the pattern was unilateral, it occurred chronically more frequently in the TMD group (23).

Individuals with TMD frequently present with limitations in mandibular movements, especially in mouth opening and mandibular lateralization. These restrictions can vary in intensity, but are considered relevant clinical indicators in the evaluation of patients with TMD (7, 11). In this study, it was observed that the maximum mouth opening of the TMD group was smaller than that of the CG; in addition, the values of mandibular lateralization were lower for the TMD group. Even though these differences were not statistically significant, they reaffirm

the data obtained in the literature that indicate a reduction in mandibular movement in patients with TMD (11, 24, 25).

It was observed that there is a tendency for the chewing preference to be on the side with greater mandibular lateralization; this was evidenced by the CG results; in fact, the number of chewing cycles and mandibular laterality were greater on the right side. In the TMDG, the number of chewing cycles and mandibular laterality were similar for both sides. Haralur et al. (26) define the chewing preference side as the side that exhibits greater efficiency and chewing comfort. The range of mandibular movement is associated with the integrity of the TMJs, and when functional adaptations occur frequently, generating alterations in mandibular movements and stomatognathic functions, the physiological and structural tolerance limit of the TMJ may be exceeded, leading the individual to develop signs and symptoms of TMD (27). It is important to note that no studies were found relating the chewing preference side with mandibular laterality measurements; therefore, we were not able to compare the data obtained in this study with those of other authors. It is suggested that more work be done covering this topic.

It was also found that VDO presents a smaller pattern in individuals from the CG, suggesting a possible association between the presence of TMD and increased VDO, especially if we observe the median VDO of the TMDG for the chronic unilateral masticatory pattern (61.9 mm), which was the highest observed in this population. This masticatory pattern promotes differentiated stimuli between the working side and the balancing side of mastication, which may aggravate TMD (19). These data contradict findings in the literature that indicate an association between decreased VDO and the presence of TMDs (28, 29). However, some studies show that variations in VDO that exceed the functional tolerance threshold of the muscles or articular cartilage may predispose to TMD (30, 31).

A study performed by Melo et al. (32) highlighted divergences in the literature regarding the effects of VDO variation on TMDs. In our study, evidence suggests that the stomatognathic system can naturally adapt to changes in VDO. Furthermore, it is observed that an increase in VDO can reduce pain in patients with myofascial pain dysfunction syndrome (33). Broadening the perspective, if we consider facial type, dolichofacial patients (who have a longer face and therefore a higher VDO value) bear an unfavorable prognosis regarding TMDs; they commonly have narrower mandibular heads within the glenoid fossa, which favors joint

instability (34). However, in our study we did not evaluate the facial type of the individuals, and it is suggested that future studies add this assessment. These discrepancies in the literature regarding VDO can be attributed to the different populations studied, the methodologies used, and the types of TMD with their distinct symptomatic manifestations. Hence new research with larger populations is needed to better understand this relationship (35).

A greater measurement of the distance from the corner of the eye to the mouth was observed on the face right side in individuals who chewed unilaterally preferentially on the left, and this can be explained as due to the elongation found in the musculature on the chewing balancing side (36). In the preferential or chronic unilateral chewing, subtle muscle asymmetries can be perceived, since the preferred chewing side will trigger greater muscle power, especially in the buccinator, masseter and temporal muscles; also a greater volume or distance in the soft tissues may be observed (37).

The results of this study appear to be relevant; however, it is important to interpret them considering the limitations inherent in the study design and sample size, which prevents statistical inference for the general population, restricting the results to the sample assessed. It is suggested that new studies be conducted with a larger number of participants to facilitate the identification of statistically significant variations. Furthermore, TMD presents a wide variation in clinical presentation; therefore, it is suggested that groups with different TMD diagnoses and severities be separated in future studies. It is further suggested that clinical assessment data be pursued by more than one evaluator with the same patient and that Fleiss's Kappa test be applied among the evaluators as well. Regarding the assessment of food consistencies, it is suggested that the IDDSI protocol be used for categorizing food textures.

5 CONCLUSION

The data from this study indicate that, in the population assessed, individuals with TMD tend to choose more frequently foods that are easier to chew (soft) and perceive some foods as harder compared to the control group’s perception. As to the analysis of the eating habits by meal groups, a statistically significant difference was observed only for the "dinner" meal, although without a statistically significant difference; food consumption frequency was also different in the other meals. The difference regarding food consistency in the food items most

chosen by the group with TMD may contribute to alterations in the orofacial musculature, as evidenced in the orofacial motor skills assessment.

Regarding facial anthropometry, there was no significant difference between the sides of the face in individuals with simultaneous bilateral chewing, suggesting facial symmetry. However, an increase in the masticatory working side was observed among individuals with preferential unilateral chewing, although without statistical significance. In the intraoral evaluation, it was found that the maximum mouth opening and the mandibular laterality measurement were smaller in the group with TMD. The VDO measurement was greater in individuals with TMD, suggesting a possible association between the presence of TMD and the increase in VDO in this study population.

Alternating bilateral chewing was predominant in both groups, but only in the group with TMD was chronic unilateral chewing recorded. The group with TMD presented a longer chewing time, although without statistical significance. A balance was observed in the number of chewing cycles between the two groups.

It is suggested that future studies investigate the eating habits and food consistencies of individuals with TMD, compared to a nutritional assessment. Furthermore, it is considered important that new studies be conducted with a larger population to obtain a greater chance of data statistical significance, evaluating the facial type of the individuals and also separating the different TMD diagnoses in order to avoid comparing masticatory function results of individuals with and without pain simultaneously.

REFERENCES

1 Berretin-Felix G, Bianchini EMG, Nunes-Queiroz JA, Campanha AS, Degan VV. Procedimentos básicos para o tratamento dos distúrbios miofuncionais orais. In: Rahal A, Motta AR, Fernandes CG, Cunha DA, Migliorucci RR, Berretin-Felix G, Editores. Manual de Motricidade Orofacial. 2014. São José dos Campos: Pulso Editorial; P.47-57.

2 Vieira VCAM, Araújo CMT, Jamelli SR. Desenvolvimento da fala e alimentação infantil: possíveis implicações. Revista CEFAC. 2016;18(6), 1359–1369. Disponível em: https://doi.org/10.1590/1982-0216201618611516.

3 Vaz DSS, Bennemann RM. Comportamento alimentar e hábito alimentar: uma revisão. Revista UNINGÁ review. Out-Dez 2014;Vol.20,n.1,pp.108-112. Disponível em: https://revista.uninga.br/uningareviews/article/view/1557.

4 Silvester CMA. Dental Revolution? The intriguing effects of the profound social and dietary changes of the 18/19th centuries on the masticatory system. Tese (PhD in Bioarchaeology and Dental Anthropology). University College London. London, 2021. Doi: 10.1371/journal.pone.0261404.

5 Ferreira CLP, Machado BCZ, Borges CGP, Rodrigues Silva MAMR; Sforza C, Felício CM. Impaired orofacial motor functions on chronic temporomandibular disorders, J. Electromyogr. Kinesiol. 2014;n. 24, p.565–571. Disponível em: doi:10.1016/j.jelekin.2014.04.005.

6 Felício, C. M. de. Motricidade orofacial: Teoria, avaliação e estratégias terapêuticas. Edusp. 1ª edição, 2020. 256p.

7 Schiffman E, Ohrbach R, Truelove E, et al. Diagnostic criteria for temporomandibular disorders (DC/TMD) for clinical and research applications: recommendations of the International RDC/TMD Consortium Network and Orofacial Pain Special Interest Group. J Oral Facial PainHeadache. 2014;28(1):6–27. Disponível em: 10.11607/jop.1151.

8 Tomé MC. Avaliação e terapia da função mastigatória. In: SILVA HJ, et al. (org.) Tratado de Motricidade Orofacial. São José dos Campos: Pulso, 2019, p.503-525.

9 Eusse-Solano PA, Vargas-García MA, Acevedo-Cassiani PY. Relación de lasimetría facial y los malos hábitos masticatorios. revisión sistemática. Revista Científica Signos Fónicos. 2020;v.6, n.1, p. 60-73. ISNN 2422-1716.

10 Cattoni, D. M. Antropometria orofacial. in: Silva, H. J.; Tessitore, A.; Motta, A. R.; Cunha, D. A.; Berretin-Felix, G.; Marchesan, I. Q. (org.). Tratado de motricidade orofacial. 1ed. São José dos Campos: Pulso editorial, v. 1, p. 335-354, 2019.

11 Marchesan IQ, Berretin-Felix G, Genaro KF. MBGR: protocolo de avaliação em motricidade orofacial com escores. In: Tessitore A, Marchesan IQ, Silva HJ, Berretin-Felix G. Práticas clínicas em motricidade orofacial. Pinhais: Editora Melo, 2019.

12 Altman, D. G. Practical statistics for medical research. New York: Chapman And Hall, 1991.

13 Li W, Cheng Y, Wei L, Li B, Zheng H. Gender and age differences of temporomandibular joint disc perforation: A cross-sectional study in a population of with temporomandibular disorders. The journal of craniofacial surgery. 2019;30(5), 1497–1498. Disponível em: 10.1097/SCS.0000000000005146.

14 Nasri-Heir C, Epstein JB, Touger-Decker R, Benoliel R. What should we tell patients with painful temporomandibular disorders about what to eat? The Journal of the American Dental Association. 2016;147(8), 667–671. Disponível em: 10.1016/j.adaj.2016.04.016.

15 Melchior MO, Magri LV, Mazzetto MO. Orofacial myofunctional disorder, a possible complicating factor in the management of painful temporomandibular disorder. Case report.

BrJP [Internet]. 2018 Jan;1(1):80–6. Disponível em: https://doi.org/10.5935/2595-0118.20180017.

16 Nishi SE, Basri R, Alam MK, Komatsu S, Komori A, Sugita Y, Maeda H. Evaluation of masticatory muscles function in different malocclusion cases using surface electromyography. J Hard Tissue Biology. 2017;26:23-8. Disponível em: https://doi.org/10.2485/jhtb.26.23.

17 Jallinoja P, Pajara P, Absetz P. Negotiated pleasures in health-seeking lifestyles of participants of a health promoting intervention. Health. 2010;14(2):115-30. Disponível em: 10.1177/1363459309353292.

18 Fassicollo CE. Análise da coordenação e sincronia dos músculos da mastigação e do pescoço durante a mastigação de pacientes com Desordem Temporomandibular crônica. Tese (Doutorado em Morfofisiologia de Estruturas Faciais) - Faculdade de Medicina de Ribeirão Preto, Universidade de São Paulo, Ribeirão Preto, 2020. Disponível em: 10.11606/T.17.2020.tde-27052020-082238.

19 Felício CM, Melchior MDO, Silva MAMRD, Celeghini RMDS. Masticatory performance in adults related to temporomandibular disorder and dental occlusion. Pró-Fono Revista de Atualização Cientifica. 2007;19(2):151-158. Disponível em: 10.1590/s0104-56872007000200003.

20 Oncins MC, Freire R, Marchesan I. Mastigação: análise pela eletromiografia e eletrognatografia. Seu uso na clínica fonoaudiológica. Revista Distúrbios da Comunicação. 2006;18(2), 155-165. Disponível em: https://pesquisa.bvsalud.org/portal/resource/pt/lil-440658.

21 Marchesan IQ, Berretin-Felix G, Genaro KF. MBGR: protocolo de avaliação em motricidade orofacial com escores. In: Tessitore A, Marchesan IQ, Silva HJ, Berretin-Felix G. (Org). Práticas clínicas em motricidade orofacial. 1 Ed. Pinhais: Editora Melo, 2014. P. 97-116.

22 Padmaja B, Neeharika S, Bindu G, Babu N, Madhulika S. Predilection of chewing side preferences and clinical assessment of its impact on temporomandibular joint. Journal of Dental and Allied Sciences. 2018;7(2), 65-69. Disponível em: 10.4103/jdas.jdas_29_17.

23 Webber P, Corrêa ECR, Bolzan GP, Ferreira FS, Soares JC, Silva AMT. Mastigação e deglutição em mulheres jovens com desordem temporomandibular. CoDAS. 2013;v. 25, n. 4, p. 375–380. Disponível em: https://www.scielo.br/j/codas/a/gVCv64HHtKwPMMYJqc3Jv4w/?lang=pt.

24 Chang CL, Wang DH, Yang MC, Hsu WE, Hsu ML. Functional disorders of the temporomandibular joints: Internal derangement of the temporomandibular joint. The Kaohsiung Journal of Medical Sciences. Apr 2018;34(4):223–30. Disponível em: 10.1016/j.kjms.2018.01.004.

25 Shu J, Feng Y, Zheng T, Shao B, Liu Z. Temporomandibular condylar articulation and finite helical axis determination using a motion tracking system. Medical Engineering & Physics. 2021 Aug;94:80–6. Disponível em: 10.1016/j.medengphy.2021.06.007.

26 Haralur SB, Majeed MI, Chaturvedi S, Alqahtani NM, Alfarsi M. Association between preferred chewing side and dynamic occlusal parameters. The Journal of International Medical Research. 2019; 47(5), 1908–1915. Disponível em: 10.1177/0300060519827165.

27 Bianchini EMG (org). Articulação Temporomandibular: implicações, limitações e possibilidades. Carapicuíba, SP: Pró-Fono; 2000. p.402.

28 Avila-Vásquez F, Vergara-Sarmiento P, Crespo-Crespo C. Vertical Dimension ofOcclusion: A comparativestudybetweenAnthropometricandKnebelman'scraniometricmethods. Acta Odontológica Latinoamericana [Internet]. Apr 2021;34(1):43–9. Disponível em: 10.54589/aol.34/1/043.

29 Shen YF, Wei MC, Li HP, et al. Vertical dimension of occlusion related to mandibular movement during swallowing. Biomedical Journal. 2021 Apr;44(2):217–22. Disponível em: 10.1016/j.bj.2019.12.006.

30 Ohnuki Y, Kawai N, Tanaka E, Langenbach GE, Tanne K, Saeki Y. Effects of increased occlusal vertical dimension on daily activity and myosin heavy chain composition in rat jaw muscle. Arch Oral Biol. 2009;54(8):783-9. Disponível em: http://dx.doi.org/10.1016/j.archoralbio.2009.05.008.

31 Figueroba SR, Desjardins MP, Nani BD, Ferreira LE, Rossi AC, Santos FA, Venâncio PC, Aguiar FHB, Groppo FC. Effect of diazepam on temporomandibular joints in rats with increased occlusal vertical dimension. Br J Oral MaxillofacSurg. 2014;52(5):438-44. Disponível em: http://dx.doi.org/10.1016/j.bjoms.2014.02.009.

32 Melo LA, Braga L, Faria J, Leite F, Oséas JMF, Almeida E. Impacto da alteração de dimensão vertical na disfunção temporomandibular: revisão integrativa. Revista Ciência Plural. 2019 Aug 26;5(2):143–60. Disponível em: https://doi.org/10.21680/2446-7286.2019v5n2ID17537.

33 Manns A, Miralles R, Santander H, Valdivia J. Influence of the vertical dimension in the treatment of myofascial pain dysfunction syndrome. J ProsthetDent, v.50, p.700-709, 1983. Disponível em: 10.1016/0022-3913(83)90213-5.

34 Esteves A. Avaliação da profundidade do palato e das dimensões do arco dentário superior em indivíduos com maloclusão e diferentes tipos faciais. Revista Dental Press de Ortodontia e Ortopedia Facial. 2007;12(4):84-98. Disponível em: https://doi.org/10.1590/S1415-54192007000400010.

35 Moreno-Hay I, Okeson JP. Does altering the occlusal vertical dimension produce temporomandibular disorders? A literaturereview. J Oral Rehabil. 2015; 42: 875-882. Disponível em: https://doi.org/10.1111/joor.12326.

36 Tiwari S, Nambiar S, Unnikrishnan B. Chewing side preference – impact on facial symmetry, dentition and temporomandibular joint and its correlation with handedness. Journalof Orofacial Sciences. 2017;9(1), 22-27. Disponível em: 10.4103/jofs.jofs_74_16.

37 Pizzol K. Influência da mastigação unilateral no desenvolvimento da assimetria facial. Revista Brasileira Multidisciplinar. 2015; 8, 215-222. Disponível em: https://doi.org/10.25061/2527-2675/ReBraM/2004.v8i2.3.

Submitted: December 14, 2024

Accepted: November 27, 2025

Published: April 13, 2026

Authors' contributions	
Ligia Patron Witwytzkyj:	Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project management, Tool provision, Data and experiment validation, Data presentation design, Original manuscript writing, Writing - revision and editing.
Graziela Mackowiesky Brigido Bernardo:	Conceptualization, Data curation, Research, Methodology, Project management, Tool provision, Data and experiment validation, Writing - review and editing.
Murilo Kazuo Iwassake:	Research, Methodology, Writing - revision and editing.
Fabiane Miron Stefani:	Conceptualization, Methodology, Project Management, Provision of tools, Supervision, Writing - review and editing.
All authors approved the final version of the text.	
Conflict of interest:	There is no conflict of interest.
Funding:	This research received no external funding.

EATING HABITS, CHEWING PATTERN, AND ANTHROPOMETRIC CHARACTERISTICS OF INDIVIDUALS WITH TEMPOROMANDIBULAR DISORDER

Corresponding author: Ligia Patron Witwytzkyj
Federal University of Santa Catarina (UFSC)
Rua Delfino Conti, Bairro Trindade. Postal Code 88040-370.
Florianópolis/SC – Brazil
ligia_lpw@hotmail.com

Editor-in-chief: Adriane Cristina Bernat Kolankiewicz. PhD