



Relationship between parafunctional habits and TMJ symptoms in university students during the COVID-19 pandemic

Relação entre hábitos parafuncionais e sintomas na ATM em universitários na pandemia da COVID-19

Relación entre los hábitos parafuncionales y los síntomas de la ATM en estudiantes universitarios durante la pandemia de COVID-19

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Abstract

Introduction: The COVID-19 pandemic has led to a number of behavioral changes, including parafunctional habits, which have become responsible for triggering signs and symptoms of temporomandibular joint (TMJ) disorders. Parafunctional habits change the normal blood flow to muscle tissues, triggering symptoms of fatigue, pain and spasm. **Objective:** To investigate the relationship between parafunctional habits and emotional aspects, mask use and sleep quality identified by university students during the COVID-19 pandemic. **Material and Method:** This is a cross-sectional, analytical, quantitative study, carried out with 182 individuals, with a mean age of 21 years. The research was conducted online,

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with questions based on an Anamnesis Index in order to identify symptoms of temporomandibular dysfunction (TMD), frequency of parafunctional habits and questions to assess the perception of university students regarding emotional aspects, mask use, dental clenching and sleep. The data was tabulated and statistically analyzed. **Results:** 99.45% of the participants have at least one parafunctional habit in their daily lives. The habit of clenching was significant when associated with emotional tension, mask wearing and the symptom of TMJ noise. Headaches, pain in the neck and/or neck and manual jaw support habits were significant in association with the TMJ noise symptom. Regarding sleep, participants slept more hours before the pandemic. **Conclusion:** During the COVID-19 pandemic, there was a significant impact on the relationship between parafunctional habits and TMJ symptoms, on the reduction of sleep duration and on the intensification of parafunctional habits.

Keywords: Speech, Language and Hearing Sciences; COVID-19; Temporomandibular Joint; Temporomandibular Joint Disorders

Resumo

Introdução: A pandemia da COVID-19 gerou diversas mudanças de comportamento, entre eles os hábitos parafuncionais, que se tornaram responsáveis pelo desencadeamento de sinais e sintomas de transtorno na articulação temporomandibular (ATM). Os hábitos parafuncionais alteram o fluxo sanguíneo normal dos tecidos musculares desencadeando sintomas de fadiga, dor e espasmo. **Objetivo:** Investigar a relação entre hábitos parafuncionais e aspectos emocionais, uso de máscara e qualidade de sono identificados por estudantes universitários durante a pandemia da COVID-19. **Material e Método:** Estudo transversal, analítico, de natureza quantitativa, realizado com 182 indivíduos, com idade média de 21 anos. A pesquisa foi realizada de modo *online*, com perguntas baseadas em um Índice Anamnésico a fim de identificar sintomas de disfunção temporomandibular (DTM), frequência dos hábitos parafuncionais e perguntas para avaliar a percepção dos universitários a respeito dos aspectos emocionais, uso de máscara, apertamento dentário e sono. Os dados foram tabulados e analisados estatisticamente. **Resultados:** 99,45% dos participantes têm ao menos um hábito parafuncional em seu cotidiano. O hábito de apertamento dentário teve significância quando associado a tensão emocional, uso de máscara e o sintoma de ruído na ATM. Dores de cabeça, dores na nuca e/ou pescoço e hábito de apoio manual sobre a mandíbula tiveram significância com o sintoma de ruído na ATM. Com relação ao sono, os participantes dormiam mais horas antes da pandemia. **Conclusão:** Durante a pandemia da COVID-19 houve impactos significantes na relação de hábitos parafuncionais com sintomas na ATM, na redução da duração do sono e na intensificação de hábitos parafuncionais.

Palavras-chave: Fonoaudiologia; COVID-19; Articulação Temporomandibular; Transtornos da Articulação Temporomandibular.

Resumen

Introducción: La pandemia del COVID-19 generó diversos cambios de comportamiento, entre ellos los hábitos parafuncionales, que se han convertido en los responsables de desencadenar signos y síntomas de los trastornos de la articulación temporomandibular (ATM). Los hábitos parafuncionales alteran el flujo sanguíneo a los tejidos musculares, desencadenando síntomas de fatiga, dolor y espasmos. **Objetivo:** Investigar la relación entre los hábitos parafuncionales y aspectos emocionales, uso del antifaz y calidad del sueño identificados por estudiantes universitarios durante la pandemia de COVID-19. **Método:** Estudio transversal, analítico y cuantitativo, realizado a 182 individuos, con edad media de 21 años. La encuesta se realizó *online*, con preguntas basadas en un Índice de Anamnesis para identificar síntomas de disfunción temporomandibular (DTM), frecuencia de hábitos parafuncionales y evaluar la percepción de los universitarios sobre aspectos emocionales, uso de antifaz, apretamiento dental y sueño. Los datos se tabularon y se analizaron estadísticamente. **Resultados:** 99,45% de los participantes tienen al menos un hábito parafuncional en su vida. El hábito de apretar dientes tuvo significación cuando se asoció con la tensión emocional, uso de mascarilla y síntoma de ruido de la ATM. Dolor de cabeza, de cuello y/o nuca y hábito de apoyo manual de la mandíbula fueron significativos en asociación con ruido de la ATM.

En cuanto al sueño, los participantes dormían más horas antes de la pandemia. **Conclusión:** Durante la pandemia COVID-19 hubo impactos significativos en la relación entre hábitos parafuncionales y síntomas de la ATM, reducción de duración del sueño y intensificación de los hábitos parafuncionales.

Palabras clave: Fonoaudiología; COVID-19; Articulación temporomandibular; Trastornos de la articulación temporomandibular.

Introduction

On March 11, 2020, the director of the World Health Organization (WHO) declared the new coronavirus (COVID-19) a pandemic. Since then, measures have been taken to slow the spread of the virus while the vaccine was not yet accessible to the global population. The WHO recommended wearing masks, frequent hand washing, constant use of hand sanitizer, social distancing, and avoiding crowds^{1,2}.

Considering this, the Ministry of Education (MEC) issued Ordinance No. 343 on March 17, 2020, advising Higher Education Institutions (HEIs) to replace in-person teaching with digital means while the pandemic situation persisted³.

Additionally, COVID-19 has led university students to experience uncertainty and concerns about their education and professional careers. As a result, university students, with the suspension of classes, may have faced difficulties both in adapting to remote activities and in dealing with emotional issues during this period^{4,5}.

Among the various types of pathologies that can arise from emotional stress are Temporomandibular Disorders (TMDs). The etiology of TMDs is commonly of anatomical, neuromuscular, or psychological origin. Studies indicate that TMD has a complex and multifactorial etiology⁶.

The onset of temporomandibular disorders is also strongly related to parafunctional habits⁷. Teeth clenching, bruxism, chewing gum, biting objects, onychophagia, resting the hand on the jaw during the day and night, cheek, lip and tongue biting among others, are some examples of harmful oral habits that negatively affect an individual's health, increasing muscle activity (muscle hyperactivity)⁸.

The relationship between symptoms in the temporomandibular joint and parafunctional habits is discussed in the literature, showing that when a parafunctional habit becomes frequent in an individual's life, muscle contractions occur that inhibit blood circulation within the tissues. Parafunctional habits alter the normal blood flow in muscle tissues,

triggering symptoms of fatigue, pain, and spasms due to increased metabolic activity. Sleep disturbances, stress, and anxiety can also impact orofacial pain control and harm daily quality of life^{9,10}.

Sleep is an essential part of life, a period of physical restructuring that protects against the natural wear of waking hours. University students who do not experience good sleep quality may have learning process difficulties and academic performance challenges¹¹.

Considering that university students experienced an emotional burden due to the pandemic and that social isolation may have been detrimental to their mental health, this study investigated parafunctional habits, mask usage, sleep, emotional aspects, and their relationship with the onset of signs and symptoms in the temporomandibular joint during the COVID-19 pandemic among undergraduate students at the Universidade Estadual do Centro-Oeste (UNICENTRO), Irati Campus.

Methodology

This research compiled with all the standards established by Resolution 466/2012 of the National Health Council regarding ethical aspects in research involving human beings. The study was approved by the Research Ethics Committee of the home institution under the approval number 4.615.166 and CAAE: 43022821.4.0000.8967. The inclusion criteria required that participants be enrolled in one of the undergraduate courses at the Universidade Estadual do Centro-Oeste, Irati Campus, be of both sexes and be over 18 years old. Exclusion criteria included not signing the Free and Informed Consent Form (ICF) and students under 18 years old.

The sample was recruited by convenience, through social media outreach (Instagram) and e-mail contact with course coordinators at the institution. For this purpose, a post was created and shared along with a link to access and complete the survey questions and questionnaire. Data collection was conducted online using the Google Forms digital platform from September 2021 to

March 2022, during the transition from remote to in-person learning.

The questionnaire questions were based on an Anamnestic Index¹² to identify TMD symptoms (it is worth noting that this index includes a TMD classification, which was not used since the focus was on symptoms rather than diagnosis).

The second was a parafunctional habits questionnaire¹³ to assess their frequency. Additional questions, designed by the researchers, were included to evaluate students' perceptions of their emotional aspects, mask use, teeth clenching, and sleep before and during the pandemic.

The data were tabulated and analyzed statistically, both descriptively and inferentially, using the Jamovi 2.3.21 software.

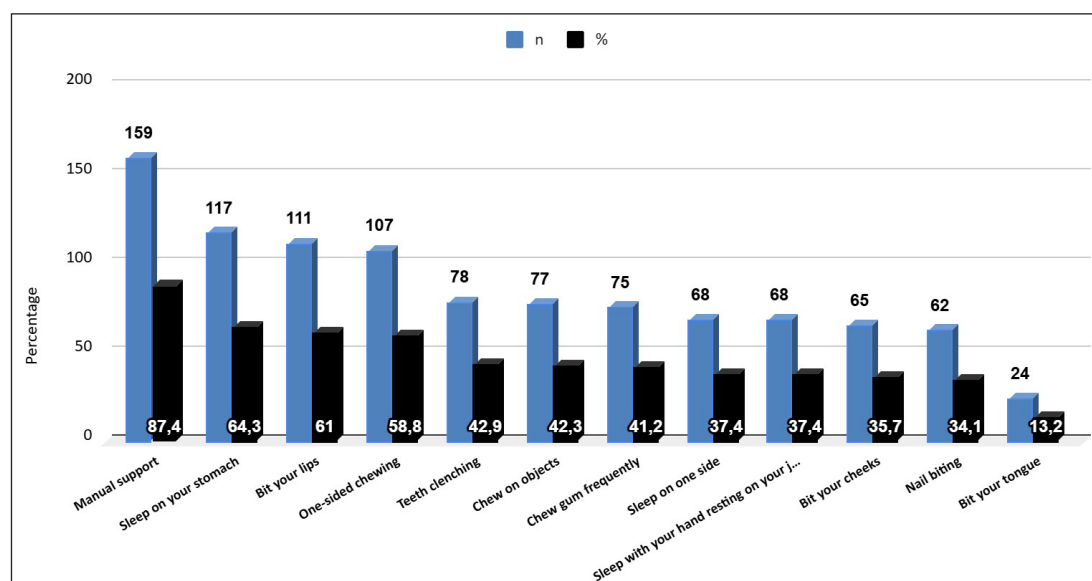
The normality distribution of the data was assessed using the Shapiro-Wilk test, which indicated a non-normal distribution for all data. Descriptive analysis utilized absolute frequency (N) and relative frequency (%), central tendency measures such as mean and median, and position (minimum, maximum, first quartile, and third quartile).

For inferential analysis, the Spearman Correlation Test¹⁴ and the Paired Wilcoxon Test were used. Spearman's test was applied to correlate study data, specifically the relationship between parafunctional habits before and during the COVID-19 pandemic, psychological issues such as insomnia, anxiety, and nervousness, sleep quality before and during the pandemic, and mask use. The Paired Wilcoxon Test was used to compare hours of sleep before and during the COVID-19 pandemic. A significance level of <5% was adopted.

Results

A total of 182 individuals participated in the study, all students from a public university in the state of Paraná, with 144 (79.1%) female and 38 (20.9%) male participants, averaging 21 years old.

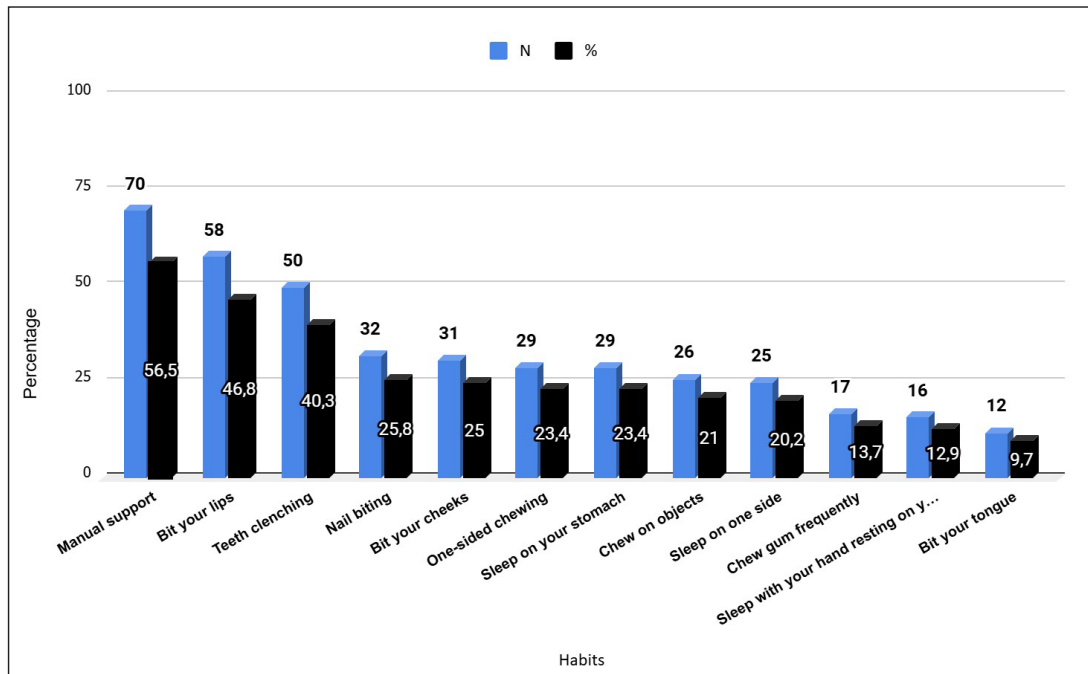
Figure 1 shows that the most common parafunctional habit among university students is resting hands on the face. It should be noted that out of the 182 participants, only 1 (male) reported having no parafunctional habits in their daily routine and was not included in the representation.



Source: Prepared by the author

Figure 1. Prevalence of parafunctional habits during the pandemic

Figure 2 shows that resting the hand on the jaw was the habit with the greatest increase.



Source: Prepared by the author

Figure 2. Intensified parafunctional habits during the COVID-19 pandemic

In Table 1, approximately 67.41% of participants reported noticing an increase in parafunc-

tional habits during the pandemic, with an average of 2 intensified habits during this period.

Table 1. Distribution of participants engaging in intensified parafunctional habits during the COVID-19 pandemic, by gender

Gender	Intensified Parafunctional Habits	N (%)	Average habits	Median habits	Minimum number of habits	Maximum number of habits
Female	Yes	103 (56.59%)	2.24	2	1	12
	No	41 (22.52%)				
Male	Yes	20 (10.98%)	1.68	1	1	6
	No	18 (9.89%)				
TOTAL	Yes	124 (68.13%)	2.12	2	1	12
	No	58 (31.86%)				

Legend: N - absolute frequency; % - relative frequency

Source: Prepared by the author



When investigating symptoms related to the temporomandibular joint from the questionnaire responses, tension/nervousness was identified as the most common symptom (Table 2).

Table 2. Frequency of symptoms related to the temporomandibular joint

Symptom	Respostas					
	Yes (%)	N	Sometimes (%)	N	No (%)	N
Do you consider yourself a tense or nervous person?	63.70	116	25.80	47	10.40	19
Do you frequently have headaches?	45.10	82	29.10	53	25.80	47
Have you noticed any noises (near the ear) when chewing or opening your mouth?	40.10	73	25.80	47	34.10	62
Do you feel pain in the back of your neck or in your neck area?	39.00	71	29.70	54	31.30	57
Have you noticed any oral habits?	30.20	55	10.40	19	59.30	108
Do you feel that your teeth do not align well?	15.90	29	9.30	17	74.70	136
Do you experience ear pain or pain in nearby areas?	12.60	23	24.20	44	63.20	115
Do you feel tired or have muscle pain when chewing?	11.00	20	27.50	50	61.50	112
Do you experience difficulty, pain, or both when opening your mouth?	7.10	13	22.50	41	70.30	128
Do you have difficulty moving your jaw forward or sideways?	5.50	10	17.60	32	76.90	140

Source: Prepared by the author

Table 3 shows that emotional tension was associated with teeth clenching ($p=0.008$).

Table 3. Relationship between emotional tension and the parafunctional habit of teeth clenching

		Emotional tension			p-value	r-value
		Yes	Sometimes	No		
Teeth clenching	Yes	N	58	15	0.008*	0.196
		%	31.87%	8.24%		
	No	N	58	31		
		%	31.87%	17.03%		

Legend: N - absolute frequency; % - relative frequency

Test: Spearman Correlation * $p < 0.05$

Source: Prepared by the author



When analyzing the association between mask use and the parafunctional habit of teeth clenching, Table 4 reveals a statistically significant result

among students who wore masks during the pandemic and the presence of the habit of clenching their teeth ($p=0.013$).

Table 4. Association between mask use and the parafunctional habit of teeth clenching

		Mask use			p-value	r-value
		Yes, during the pandemic		No		
Teeth clenching	Yes	N	33	45	0.013*	0.183
		%	18.13%	24.73%		
	No	N	26	78		
		%	14.29%	42.85%		

Legend: N - absolute frequency; % - relative frequency

Test: Spearman Correlation * $p < 0.05$

Source: Prepared by the author

Table 5 shows that students who experienced jaw joint noise also had other associated symptoms,

such as headaches ($p<0.001$), neck/nape pain ($p=0.019$), and teeth clenching ($p=0.008$).

Table 5. Association between noises in the temporomandibular joint and headaches, neck pain, and teeth clenching

		Noises in the TMJ				p-value	r-value
		Yes	Sometimes	No			
Headache	Yes	N	44	17	21	<0.001*	0.258
		%	24.17%	9.34%	11.55%		
	Sometimes	N	18	17	18		
		%	9.89%	9.34%	9.89%		
	No	N	11	13	23		
		%	6.04%	7.14%	12.64%		
Neck pain	Yes	N	37	14	20	0.019*	0.174
		%	20.36%	7.72%	10.99%		
	Sometimes	N	20	14	20		
		%	10.99%	7.72%	10.99%		
	No	N	16	19	22		
		%	8.79%	10.45%	12.08%		
Teeth clenching	Yes	N	38	22	18	0.008*	0.196
		%	20.9%	12.08%	9.89%		
	No	N	35	25	44		
		%	19.22%	13.74%	24.17%		

Legend: N - absolute frequency; % - relative frequency

Test: Spearman Correlation * $p < 0.05$

Source: Prepared by the author

University students with the parafunctional habit of resting their hands on their face during the day ($p=0.030$) and while sleeping ($p=0.032$) also reported experiencing jaw joint noise (Table 6).

Table 6. Association between parafunctional habits of manual support and sleeping with hand supported on the mandible and noises in the temporomandibular joint

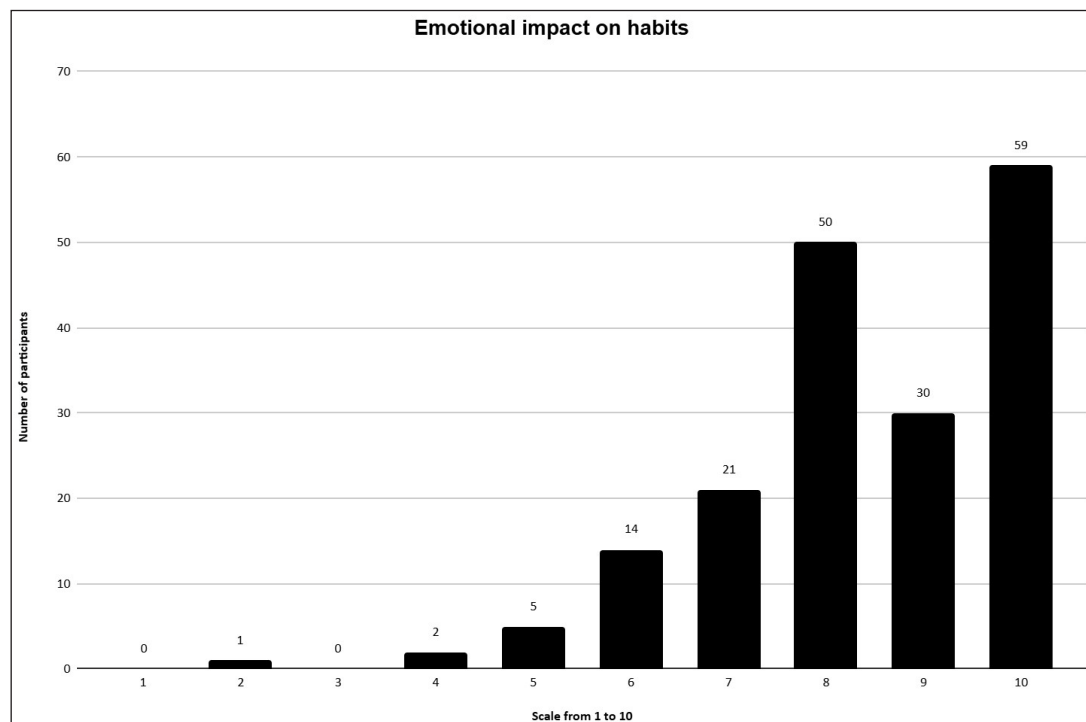
		Noises in the TMJ			p-value	r-value
			Yes	Sometimes	No	
Manual support on the mandible	Yes	N	68	41	50	0.030*
		%	37.36%	22.53%	27.47%	
	No	N	5	6	12	
		%	2.75%	3.3%	6.59%	
Sleeping with hand supported on the mandible	Yes	N	35	14	19	0.032*
		%	19.22%	7.7%	10.45%	
	No	N	38	33	43	
		%	20.9%	18.13%	23.6%	

Legend: N - absolute frequency; % - relative frequency

Test: Spearman Correlation * $p < 0.05$

Source: Prepared by the author

Figure 3 presents data on the emotional impact scale in relation to parafunctional habits. Students rated the impact from 0 to 10 (where 0 was no impact and 10 was a high impact), showing that the average emotional impact score among participants was 8.32.



Source: Prepared by the author

Figure 3. Graph of emotional impacts on the parafunctional habits of the participants

Table 7 compares daily sleep hours before and during the COVID-19 pandemic. It shows that participants slept more hours before the pandemic than during it ($p=0.036$).

Table 7. Comparison of daily sleep hours before and during the COVID-19 pandemic

		N (%)	Mean	Standard Deviation	1st Quartile	Median	3rd Quartile	p-value
Sleep hours	Before the pandemic	182 (100%)	1,86	0.698	2	1	2	0.036*
	During the pandemic	182 (100%)	1,73	0.766	2	1	2	

Legend: Number 0 represents 4 hours of daily sleep; number 1 represents 5 to 6 hours of sleep; number 2 represents between 7 and 8 hours of sleep; and number 3 represents 8 hours of sleep.

Test: Paired Wilcoxon Test * $p < 0.05$

Source: Prepared by the author

Table 8 reveals that anxiety was an emotional aspect related to insomnia during the pandemic ($p=0.010$).

Table 8. Relationship between anxiety and insomnia

		Anxiety			p-value	r-value
		Yes, Before the Pandemic	Yes, During the Pandemic	No		
Insomnia	Yes, Before the Pandemic	N 31	9	2	0.010*	0.191
		% 17.03%	4.95%	1.1%		
	Yes, During the Pandemic	N 12	22	2		
		% 6,59%	12.08%	1.1%		
	No	N 57	32	15		
		% 31.32%	17.59%	8.24%		

Legend: N - absolute frequency; % - relative frequency

Test: Spearman Correlation * $p < 0.05$

Source: Prepared by the author

Discussion

Some studies suggest that the prevalence of parafunctional habits among university populations is high, ranging from 60% to 100% of this demographic^{15,16}. The reason why can be attributed to the numerous demands of academic life, as stress, anxiety, and daily concerns can trigger or increase the frequency of these habits^{7,17}. In this study, carried out during the COVID-19 pandemic, around 99.45% (181) of the students reported some form of parafunctional habit in their daily lives, and approximately 67.41% (122) of participants felt that these habits intensified during this period, with an average of 2.12 intensified habits. In a study with

172 participants, individuals who reported engaging in parafunctional habits were going through periods of stress and/or anxiety⁸.

Teeth clenching is often seen as a parafunctional habit in response to stress and anxiety¹⁸. Significant values were obtained for the relation between teeth clenching and emotional tension, aligning with literature that indicates COVID-19 had significant psycho-emotional effects, resulting in the intensification of bruxism and TMD symptoms¹⁹.

During the COVID-19 pandemic, personal protective masks were also constantly used. In this study, all students wore masks, as their use was mandatory. The results indicate that individuals who wore masks developed the habit of clenching



their teeth. Intensive mask use can lead to repetitive muscle strain and potentially cause alterations in dental occlusion. Studies from the pandemic period showed an association between increased mask use and some adverse effects on oral cavity well-being, including changes in the temporomandibular joint²⁰.

It is also noteworthy that, during the COVID-19 pandemic, presential courses at many universities were suspended and replaced with remote learning. Students spent long hours sitting for classes and academic tasks, often adopting poor posture, resulting in neck, shoulder, dorsal, and lumbar spine pain. Symptoms such as headaches, neck, and nape pain were associated with TMJ noise, supporting other studies indicating that postural deviations influence Temporomandibular Disorders^{21,22}.

During the pandemic period, behavioral changes also occurred, among them, parafunctional habits¹⁵. The habit of manual support on the jaw during the day and at night was also related to the symptom of joint noise in the TMJ. One possible hypothesis is that students adopted improper postures to attend remote classes, including manual support. Studies report that manual support on the jaw is the most prevalent parafunctional habit among university students^{16,17}. This habit causes an irregular accommodation of the jaw in relation to the skull and cervical region, which can have a direct impact on the TMJ¹⁹.

The present study indicates that participants slept more before the pandemic and found a significant association between insomnia and anxiety. Research confirms that the pandemic negatively affected young university students' health, worsening sleep and increasing poor sleep quality²³. Faced with academic demands, university students often alter their sleep-wake cycles, leading to chronic sleep deprivation that affects the quality of life²⁴. Good sleep quality is essential for regulating emotional states and psychological aspects, and individuals with impaired sleep quality were more impacted during COVID-19^{11,25}.

Thus, another aspect investigated was the academics' perception of how much their emotional state impacted their parafunctional habits; they were asked to give a score from 0 to 10 (0 being no impact and 10 being very impactful). The average score was 8.42, indicating that participants perceived a strong influence of emotional state

on daily parafunctional habits. This aligns with another study among university students, which observed greater mental strain during the pandemic compared to the pre-pandemic period⁵.

Stress, anxiety, sleep difficulties, and some medications are factors that can increase the intensity and frequency of parafunctional activities. Hence, a multidisciplinary approach is essential when these habits negatively impact an individual's quality of life²⁶. Among the professionals trained to work on the impacts of parafunctional habits and temporomandibular disorders are speech therapists. Speech therapy is essential in preventing injuries and rehabilitating compromised stomatognathic functions and, consequently, in reducing orofacial pain²⁷.

It is also noteworthy that the speech-language therapy approach, both in prevention and rehabilitation, must be integrated with other areas of knowledge to construct a perspective that considers the individual, in an interdisciplinary manner. Dentistry will focus on structural aspects, with interventions for surgery, maxillary and mandibular repositioning, dental alignment, and adjustment among other activities, when necessary. Speech-language therapy, on the other hand, will be dedicated to the functions of the stomatognathic system, considering the interference of parafunctional habits and temporomandibular dysfunctions^{28,29}.

In this way, both areas mentioned, along with other relevant disciplines, can contribute to individuals' quality of life. This approach is particularly relevant for the population of this study, who struggle with emotional factors. As highlighted in other research, emotional determinants can influence pain perception, and therefore, some patients may not benefit from conventional treatments, making it necessary to integrate/combine multiple interventions³⁰.

During this research, some participants reached out after completing the questionnaire to report that they had noticed the impacts of parafunctional habits during the pandemic period. All were informed about the option of adding their names to a waiting list at UNICENTRO's Speech-Language Therapy Clinic and were advised on the importance of undergoing a speech-language evaluation and/or treatment.



Conclusion

Parafunctional habits were found to be related to the onset of signs and symptoms in the temporomandibular joint during the COVID-19 pandemic. In this study, significant impacts were noted, with a connection between these habits and decreased hours of sleep, mask use, and emotional states associated with TMJ symptoms. The students also expressed a perception that their emotional state influenced their parafunctional habits.

The target audience of this research reported TMJ symptoms and parafunctional habits that can contribute to the onset of Temporomandibular Disorders (TMDs), highlighting the need for guidance on preventing or treating this pathology.

Further research is recommended, specifically conducted by speech-language pathologists, as few studies have been published in this field, which is well-equipped to promote health, prevent and treat temporomandibular disorders. This study aims to contribute to speech-language pathology by encouraging a deeper investigation into the quality of life of university students and underscores the importance of implementing health promotion and preventive programs within the university to mitigate harm in a population at high risk for developing such habits.

One limitation of this study was the predominance of female participants, due to the high participation of students from the Speech-Language Therapy program, which is predominantly female. It is suggested that future research investigate the effect of parafunctional habits on TMD symptoms with a sample balanced by gender.

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