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The anxiety, depression, and TMD: Multidisciplinary therapy

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Introduction
Temporomandibular disorder (TMD) affects the jaw and muscles, often linked to stress, anxiety, and sleep issues. Comprehensive care addressing physical and psychological factors improves outcomes.

Objective
This study proposed a multidisciplinary approach (psychologists, dentists, and physical therapists) to treat these conditions with non-pharmacological techniques, aiming for a more effective and personalized treatment.

Method
The research was conducted at the Sacomã Basic Health Unit in São Paulo, Brazil, and included 12 healthcare professionals in an active intervention and 6 patients as a control group during 1 month. The intervention consisted of four weekly one-hour sessions and home therapies sent via WhatsApp, utilizing stretching, *mindfulness*, thermotherapy, self-massage, and cognitive-behavioral therapy. Participants completed pre- and post-intervention questionnaires on depression (PHQ-9), anxiety (GAD-7), bruxism (OBC), and pain (GCPS and Pain Drawing).

Results
The interventions resulted in significant reductions in the PHQ-9 (p=0.028), GAD-7 (p=0.039), OBC (p=0.015), and PD (p=0.016) scales, demonstrating the positive impact of group dynamics. Additionally, there was a decrease in pain and an improvement in the quality of life of the participants.

Conclusions
Despite sample limitations, the data indicate that multidisciplinary interventions can effectively manage TMD, resulting in reduced pain and associated symptoms. The approach showed potential to improve patients' quality of life, highlighting the importance of integrated and personalized treatment. Future studies with larger samples and extended follow-up are necessary to validate these findings and expand the applicability of the interventions.

Keywords:
Bruxism
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Introduction

Temporomandibular disorder (TMD) encompass a spectrum of musculoskeletal and neuromuscular conditions involving the temporomandibular joint, masticatory muscles, and associated anatomical structures. Oral parafunctional behaviors, including bruxism and clenching, further aggravate TMD by inducing persistent masticatory muscle overuse and joint strain (1,2). This multifaceted disorder affects approximately 5–12% of the population and is the second most common musculoskeletal condition resulting in chronic pain and disability (3,4), affecting both physical and mental well-being (3,5,6).

The etiology of TMD is multifactorial, involving a complex interplay between biological, psychological, and behavioral factors. Evidence consistently highlights the association of psychological distress—particularly anxiety and depression—with the onset, persistence, and severity of TMD (6,7). Sleep disturbances also play a critical role, interacting with psychological stressors to compound symptom severity (2). These factors amplify nociceptive sensitivity, complicate clinical outcomes, and diminish the efficacy of conventional therapeutic interventions (1,2,4,7).

The revised Diagnostic Criteria for TMD emphasize a dual-axis assessment that includes both physical and psychosocial evaluations, facilitating comprehensive treatment planning (4). Addressing the psychological, behavioral, and physical dimensions of TMD is essential for optimizing patient outcomes and mitigating the debilitating impact of this condition (1,2,4,6).

Multidisciplinary approaches have proven promising in managing chronic pain conditions and psychological stress (2,8–10). However, there is a scarcity of studies specifically relating the worsening of TMD and chronic pain to psychological factors in frontline healthcare workers during a pandemic (5,11).

This study aims to evaluate the effectiveness of a multidisciplinary intervention in a group of healthcare workers suffering from anxiety and/or depression and pain related to temporomandibular dysfunction. Non-pharmacological intervention techniques from psychology (12,13), dentistry (14), and physical therapy (15) were combined, aiming to improve the physical and mental conditions of patients in these situations.

Methods

Study Design

The study was a prospective, randomized controlled trial conducted at the Sacomã Basic Health Unit (UBS) in São Paulo, Brazil, from January 2022 to April 2022, during the COVID-19 pandemic. The study protocol was approved by the institutional ethics committee (process number 51345121700000086). A total of 18 individuals, aged between 29 and 45 years, diagnosed with TMD, were included in the clinical trial. Participants were divided into two groups:

Group 1 (multidisciplinary treatment- MT): Composed of 12 healthcare professionals (10 women and 2 men), voluntarily recruited to participate in the multidisciplinary treatment.

Group 2 (control - conventional treatment - CT): Comprised of 6 patients (5 women and 1 man) selected by the general practitioner at the UBS, who continued with conventional treatment

Pain intensity was evaluated and measured using the Visual Analog Scale (16,17), and only participants (from both groups) who self-reported a pain intensity of up to 6 on a scale of 0 to 10 were included in the study.

The reported pain characteristics were described as tired and/or irritating. Exclusion criteria for both groups included: burning or shock-like pain (neuropathic), throbbing pain, pain that awakens the patient during sleep, pain with an intensity greater than 6 on the VAS, and suspected cases of pain secondary to other conditions, such as meningitis, tumors, or changes in systemic blood pressure. Patients in MT participated in pre-scheduled weekly sessions, while CT maintained conventional medication-based treatment. Both groups signed the Informed Consent Form (ICF). The multidisciplinary treatment consisted of techniques included stretching (15), mindfulness (participants received audio instructions for home activities via WhatsApp) (13), thermotherapy in the masseter, temporal, and neck areas for 20 minutes, three times a day (18), self-massage in the temple and masseter areas, and cognitive-behavioral therapy, including the N exercise, which is a behavioral exercise where the patient avoids clenching their teeth by pronouncing the letter N and sealing the lips without touching the teeth (1,19). These MT is four weekly sessions, each lasting 60 minutes, supplemented by daily home.

Outcome Measures

All participants completed standardized questionnaires at the beginning and end of the study (1 month) to assess symptoms of depression, anxiety, bruxism, and pain.

Description of Variables:

The scales used for assessment were:

Patient Health Questionnaire-9 (PHQ9): Assesses

the presence and severity of depressive symptoms, consisting of 9 questions that reflect the major symptoms of depression according to DSM-IV (20).

Generalized Anxiety Disorder (GAD7): A brief instrument for assessing the presence and severity of generalized anxiety symptoms (21).

Pain Drawing (PD): A graphical representation of the areas of the body where the patient feels pain (21).

Oral Behaviours Checklist (OBC): Evaluates parafunctional habits, such as bruxism and teeth clenching (22).

Graded Chronic Pain Scale (GCPS): Assesses the intensity of chronic pain and its functional impact, classifying pain into five grades: Grade 0 (no pain), Grade I (low disability ± low intensity), Grade II (low disability ± high intensity), Grade III (high disability ± moderately limiting), and Grade IV (high disability ± high intensity) (23). All participants signed the Informed Consent Form (ICF), and data collection was anonymous, following COVID-19 safety protocols.

Three t-student tests evaluated three key hypotheses:

1 – null hypothesis: The population means of the difference between initial and final periods do not differ between groups; 2 - No effect in the MT group 3 - No effect in the CT group.

Results

Various variables were considered, including sex, anxiety scales, depression, pain, oral habits, and the functional impact of chronic pain, as well as as well as statistical analysis (24, 25), which are detailed in the Figure 1, Table 1 and 2.

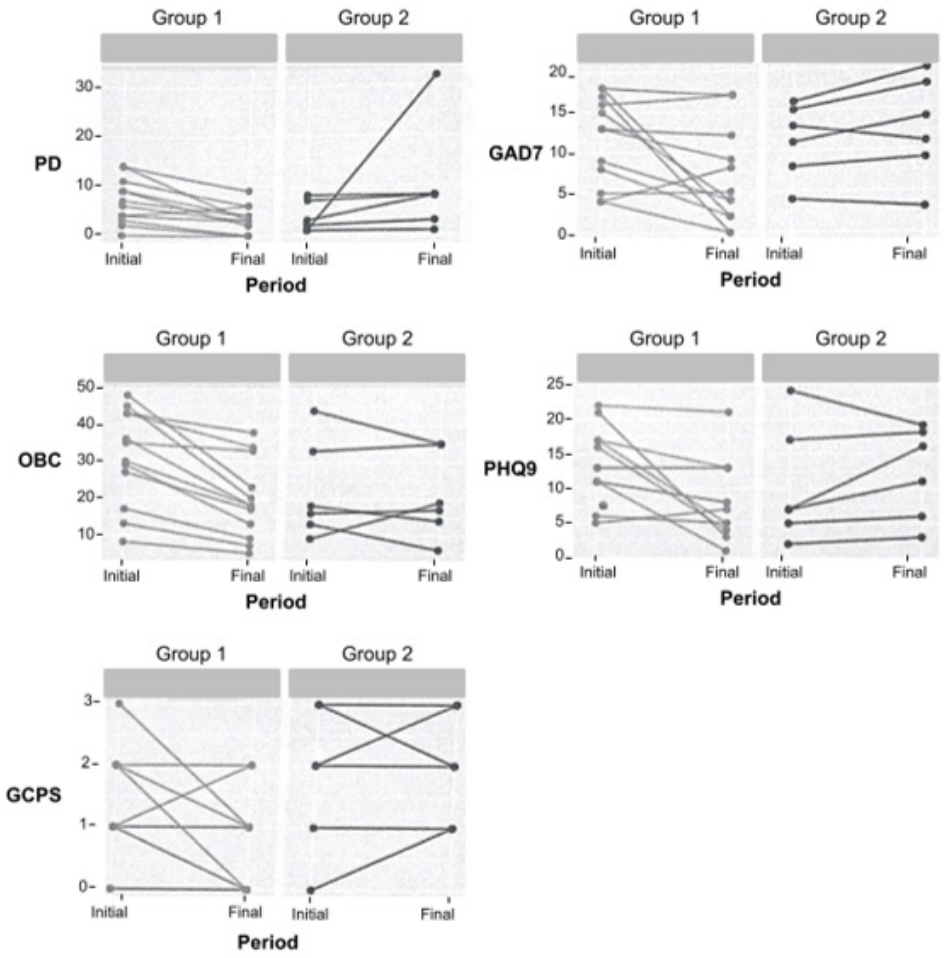

Figure 1. Evolution of the variables PD. GAD-7, OBC, PHQ-9 and GCPS for individual patients in the multiprofessional (1) and conventional (2) treatments groups.PD - Pain Drawing, GAD7 - Generalized Anxiety Disorder, OBC - Oral Behaviours Checklist, PHQ9 - Patient Health Questionnaire-9, Group 1 (Multidisciplinary Treatment), Group 2 (Control – Conventional Treatment).

Specifically for the categorical variable GCPS, the comparison between groups and periods was performed using a non-parametric analysis of variance (ANOVA) for ordinal data with repeated measures and two factors (group and period). ANOVA used to test the hypotheses of no between-individuals effect for different groups, no within-individuals effect (initial and final periods), and no interaction between these factors. There was no significant evidence of interaction effects between group and period (p-value = 0.061) or period effects (p-value = 0.378) on the individuals' degree of chronic pain. However, there was evidence of a group effect (p-value = 0.026). In other words, the absence of interaction and period effects indicates that chronic pain does not change across the two periods in either group. Therefore, the treatment effect was not significant.

Table 1. Proportion of patients according to oral habit, pain points, anxiety, depression, and chronic pain, before and after the follow-up period for the treatments of multiprofessional and conventional, and summary measures during 1 month.

Variables	Multiprofessional treatment		Conventional treatment	
	Day 0	**Day 30**	**Day 0**	**Day 30**
OBC				
0	0 (0%)	0 (0%)	0 (0%)	0 (0%)
1 – 24	3 (25%)	9 (75%)	4 (67%)	4 (67%)
25 – 84	9 (75%)	3 (25%)	2 (33%)	2 (33%)
Mean	31.17	19.58	22.17	21.00
Standard Deviation	13.09	10.77	13.47	11.71
Mean difference	11.59		1.17	
Standard Deviation difference	7.88		6.97	
PHQ9				
0 – 4	0 (0%)	3 (25%)	1 (0%)	1 (17%)
5 – 9	2 (17%)	5 (42%)	3 (17%)	1 (17%)
10 – 14	5 (42%)	3 (25%)	0 (42%)	1 (17%)
15 – 19	3 (25%)	0 (0%)	1 (25%)	3 (50%)
20 – 27	2 (17%)	1 (8%)	1 (17%)	0 (0%)
Mean	13.58	8.42	10.33	12.17
Standard Deviation	5.28	5.65	8.38	6.62
Mean difference	5.16		-1.84	
Standard Deviation difference	6.26		4.58	
GAD7				
0 – 4	2 (17%)	6 (50%)	1 (17%)	1 (17%)
5 – 9	3 (25%)	3 (25%)	1 (17%)	1 (17%)
10 – 14	2 (17%)	1 (8%)	2 (33%)	1 (17%)
15 – 21	5 (42%)	2 (17%)	2 (33%)	3 (50%)
Mean	11.67	6.67	10.33	12.17
Standard Deviation	5.43	6.02	8.38	6.62
Mean difference	5.00		-1.84	
Standard Deviation difference	6.59		4.58	
PD				
0 (None)	1 (8%)	3 (25%)	0 (0%)	0 (0%)
1 (Light)	0 (0%)	0 (0%)	2 (33%)	1 (17%)
2 (Moderate)	1 (8%)	1 (8%)	1 (17%)	0 (0%)
≥ 3 (Severe)	10 (84%)	8 (67%)	3 (50%)	5 (83%)
Mean	6.92	3.33	3.67	10.00
Standard Deviation	4.58	2.74	3.08	11.19
Mean difference	3.59		-6.53	
Standard Deviation difference	3.40		12.20	
GCPS				
Level 0	3 (25%)	6 (50%)	1 (17%)	0 (0%)
Level I	5 (42%)	4 (33%)	1 (17%)	2 (33%)
Level II	3 (25%)	2 (17%)	2 (33%)	2 (33%)
Level III	1 (8%)	0 (0%)	2 (33%)	2 (33%)

PD- Pain Drawing, GAD7- Generalized Anxiety Disorder, OBC- Oral Behaviours Checklist, PHQ9 - Patient Health Questionnaire-9

Table 2. p-values associated with the three hypothesis tests for the variables PD, GAD7, OBC, and PHQ9.

Hypothesis	PD	GAD7	OBC	PHQ9
1 (null hypothesis)	0.016	0.039	0.015	0.028
2 (no effect MT)	0.004	0.024	<0,001	0.016
3 (no effect CT)	0.260	0.235	0.699	0.372

PD- Pain Drawing, GAD7- Generalized Anxiety Disorder, OBC- Oral Behaviours Checklist, PHQ9- Patient Health Questionnaire-9

Our team is planning a large-scale future study. To recommend an appropriate sample size, the primary hypothesis focuses on assessing whether the difference between the initial and final period values for each of the variables (PD, GAD7, OBC, and PHQ9) varies between the case and control groups. Only numerical variables were included to streamline the recommendations. We propose using equal sample sizes for each group to enhance the precision of comparisons and simplify the analysis of variance (26). To calculate the sample size (n) per group, the following parameters were taken into account

- DIF: standard deviation of the differences observed in the sample;
- α: significance level;
- β: test power;
- Δ: mean difference in DIF between the case and control groups considered significant;
- r: number of factor levels (for this study, r = 2).

Scenarios were constructed for different Δ values. The Δ_1 values correspond to the differences observed in the pilot study sample, which, based on the scales of the questionnaires, represent intervals indicating a change in category for each variable. For Δ_2 and Δ_3, 1 unit was subtracted from the difference of $\Delta_{(i-1)}$, allowing for the simulation of scenarios with greater similarity between groups. Table 3 summarizes all Δ values considered for each scenario, and Table 4 presents the standard deviations of the differences observed in the sample for each variable. Table 5 summarizes the proposed sample size scenarios according to each variable, significance level (α), and test power (1-β).

Table 3. Values of Δ considered for each scenario. The Δ_1 values correspond to the differences observed in the pilot study sample, which, based on the scales of the questionnaires, represent intervals indicating a change in category for each variable. For Δ_2 and Δ_3, 1 unit was subtracted from the difference of $\Delta_{(i-1)}$, allowing for the simulation of scenarios with greater similarity between groups.

Variable	Δ_1	Δ_2	Δ_3
PD	10	5	2
GAD7	6	4	2
OBC	10	5	2
PHQ9	7	4	2

PD- Pain Drawing, GAD7- Generalized Anxiety Disorder, OBC- Oral Behaviours Checklist, PHQ9- Patient Health Questionnaire-9

Table 4. Standard deviations of the differences found in the sample for each variable considered Values of sample standard deviation.

Variable	Standard Deviation difference
PD	7.39
GAD7	5.63
OBC	7.61
HQ9	5.79

PD- Pain Drawing, GAD7- Generalized Anxiety Disorder, OBC- Oral Behaviours Checklist, PHQ9- Patient Health Questionnaire-9

Table 5. Sample size scenarios, according to each variable and significance level (α) and test power (1-β):

Variable	α	(1 - β)	n_{Δ_1}	n_{Δ_2}	n_{Δ_3}
PD	0.05	0.80	10	36	216
	0.05	0.90	13	47	288
GAD7	0.05	0.80	15	33	126
	0.05	0.90	20	43	168
OBC	0.05	0.80	11	38	229
	0.05	0.90	14	50	306
PHQ9	0.05	0.80	12	34	133
	0.05	0.90	16	46	178

PD - Pain Drawing, GAD7 - Generalized Anxiety Disorder, OBC - Oral Behaviours Checklist, PHQ9 - Patient Health Questionnaire-9

The analysis of Table 5, considering different scenarios and variables, concluded that for a significant level of 5% and a statistical power of 80%, the ideal number of patients to be selected for each group in future studies should be 36.

Discussion

The increase in cases of TMD and bruxism, often attributed to excessive stress (11). In this study, which investigated the effectiveness of a multidisciplinary intervention in the treatment of chronic pain and psychological conditions associated with TMD among healthcare professionals, we observed promising results that reflect the effectiveness of integrated, non-pharmacological approaches. The results found in this study confirmed that the multidisciplinary intervention provided significant improvements in all evaluated variables — pain, anxiety, depression, oral habits, and the functional impact of chronic pain — when compared to traditional medication-based treatment. Statistically significant reductions on the PHQ-9 (p= 0.028), GAD-7 (p= 0.039), OBC (p= 0.015), and PD (p= 0.016) scales demonstrated the positive impact of the group intervention dynamics, which included techniques such as mindfulness (12,13), stretching (15), thermotherapy (18), self-massage, and cognitive-behavioral therapy (14). In contrast, the group receiving conventional treatment showed stabilization or even worsening in some variables, such as chronic pain and anxiety. These results suggest that pharmacological approaches alone are insufficient to treat associated psychosomatic conditions, reinforcing the importance of holistic interventions, especially for patients subjected to continuous stress, such as frontline workers during the pandemic. Although the number of participants in the intervention group was small (12 people), the effects of multidisciplinary therapy seem to indicate a trend toward efficacy. Future studies with larger samples, as suggested by the statistical power analysis, could provide broader confirmation of the benefits observed in this trial.

Conclusion

This study demonstrated the effectiveness of multidisciplinary approaches in managing chronic pain, anxiety, and depression in healthcare workers with temporomandibular dysfunction. Multidisciplinary interventions that combined physical and psychological techniques—such as stretching, mindfulness, thermotherapy, self-massage, and cognitive-behavioral therapy—proved to be superior to conventional medication-based treatment in alleviating both physical and emotional symptoms.

The data suggest that integrated treatments may be an effective strategy for managing TMD and chronic pain associated with psychological stress, especially in high-demand contexts, such as those faced by healthcare professionals during the pandemic. Future studies with larger samples and longer follow-up periods are necessary to confirm these findings and expand the applicability of these interventions.

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