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Research Article

Comparative Effects of Dental Treatment and Two Different Physical Therapy Interventions in Individuals with Bruxism: A Randomized Clinical Trial

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Abstract

Objective: To compare the efficacy of dental treatment and two different physical therapy interventions in individuals with bruxism.

Methods: A total of 72 individuals with bruxism were randomly allocated to the massage (massage with stretching exercises), relaxation (relaxation with imagination therapy) groups (n=24 each; biweekly 40-min sessions over 6 weeks) or the dental group (n=24; direct restoration; two 2-h sessions 1 week apart). Primary outcomes included muscle pain and symptoms, and mandibular opening. Secondary outcomes included anxiety, stress, depression, oral health and sleep quality. Outcomes were evaluated at baseline, 6 weeks and 2 months post-initial intervention by a blinded assessor. Physical therapy interventions included individual sessions that lasted 40 min biweekly for 6 weeks and dental treatment, two 2-h individual sessions conducted a week apart. The level of significance established was α=5%. RESULTS: After 6 weeks, the improvement with difference among massage and relaxation groups and dental group was observed in muscle pain, symptoms, anxiety, stress, depression and sleep quality ($p<0.001$). Relaxation group exhibited significantly greater improvement in oral health than dental group ($p<0.001$). These effects were sustained for up to 2 months.

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Conclusion: Therefore, two physical therapy interventions are superior to dental treatment in the improvement of muscle pain, symptoms, anxiety, stress, depression and sleep quality in individuals with bruxism. Oral health improves more with relaxation with imagination therapy than with dental treatment.

Keywords: Bruxism; Pain; Oral health; Dental care; Dentistry; Physical therapy modalities.

Introduction

Bruxism is repetitive activity of the masticatory muscles characterized by the clenching and/or grinding of teeth while asleep and/or when awake [1]. Study demonstrates that 85% to 90% of the population will experience bruxism episodes at some point in their lives [2]. Moreover, it has been considered the most harmful non-functional activity to the stomatognathic system and related with muscle pain, symptoms, mandibular opening limitation, anxiety, stress, depression, poor oral health and sleep quality. Therefore, since there is not a definitive treatment for bruxism, it is a challenge for health professionals [3,4].

Conservative management practices in bruxism focus on controlling symptoms and preventing its adverse effects [3,4]. Some dental treatments include splint therapy and direct restoration [4,5]. Physical therapy modalities used in bruxism approach electrotherapy, [6-14] therapeutic exercises [15], manual therapy [16], cognitive behavioral therapy [17-19], and muscle relaxation [20].

Despite the contrast, studies compare electrotherapy, manual therapy and cognitive behavioral therapy with splint therapy. However, the results are contradictory and superiority between these management practices remains controversial [12,14,16,18]. Thus, it is not clear which of the treatments are more effective in clinical manifestation of bruxism. Moreover, little is known regarding the comparative effects of physical therapy interventions-including massage therapy, therapeutic exercises and muscle relaxation and dental treatment by the direct restoration.

Although few clinical trials have approached massage therapy, therapeutic exercises and muscle relaxation in bruxism [15-20], massage with stretching exercises and relaxation with imagination therapy may be differentiated therapeutic approaches. They focus on the biopsychosocial model that allows a broad view of individuals with pain and bruxism, without dissociation between mind and body and with the integration of biological and psychosocial factors [21]. Additionally, dental treatment, involving direct restoration of dental surface with composite resin, although little approached, has been used with the goal of re-establishing aesthetic, morphological and functional integrity of teeth. But it may alter muscular activity and relieve clinical consequences of bruxism [3-5]. Furthermore, most studies have presented poor methodological quality, thus precluding a definitive conclusion regarding their findings [6-20].

The present study aimed to compare the effect of dental treatment and two different physical therapy interventions on muscle pain, symptoms, mandibular opening,

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anxiety, stress, depression, sleep quality and oral health in individuals with bruxism with hypothesis of greater improvement in these outcomes in individuals of one of physical therapy interventions (massage with stretching or relaxation with imagination therapy) relative to dental treatment at 6 week and 2 month post-initial intervention.

Methods

Study design

This blind randomized clinical trial involving individuals with bruxism was approved by the ethics committee of the School of Medicine, University of Sao Paulo (209369/2013) and has been registered at clinicaltrials.gov (NCT01778881). The protocol has been published previously [22]. Informed participant consent was obtained at enrollment.

Participants

Of the individuals that sought treatment for bruxism, 72 were referred by the Department of Operative Dentistry of the School of Dentistry, University of São Paulo, Brazil. The inclusion criteria were as follows: pain intensity scores ≥ 3 in the masseter, anterior temporalis, upper trapezius, and sternocleidomastoid muscles and symptom of headache, at the moment of assessment, evaluated by the visual analogue scale (VAS); clinical diagnosis of probable sleep and possible awake bruxism by an experienced professional dentist, confirmed according to the diagnostic criteria of the International Classification for Sleep Disorders (ICSD) of the American Academy of Sleep Medicine [1,23] and awareness of clenching and/or grinding of teeth during the day [24] and 18-60 years of age.

The exclusion criteria were

1. more than two missing teeth, except the third molars;
2. systemic and/or degenerative diseases;
3. arthrogenic or mixed temporomandibular disorders (TMD; groups: II or III, I and II, or I and III) according to the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD axis 1) [25];
4. professional diagnosis of neurological and/or psychiatric disorders except anxiety and depression;
5. medications potentially affecting sleep/motor functions;
6. periodontal diseases;
7. alcohol and/or drug abuse;
8. removable upper/lower prosthesis;
9. total prosthesis;
10. history of direct orofacial trauma or surgery; and
11. ongoing physiotherapeutic, dental, speech, psychological treatments for bruxism.

Interventions

After initial assessment, all participants received information regarding bruxism and treatments. Physical therapy interventions included massage (stretching, massage, and diaphragmatic breathing) and relaxation (progressive muscular relaxation with imagination and diaphragmatic breathing). Individual sessions with identical procedures for all participants of a group lasted 40 min

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biweekly for 6 weeks (Figure 1). Participants in the dental group received direct composite resin restoration for anterior guidance (incisal edge of the incisors and canines) in two 2-h individual sessions conducted a week apart and maintenance periods 30, 60, and 90 days at 2-month post-initial intervention. All interventions were administered by specialized physiotherapist and dentist.

Interventions	Description	Sets/Duration
Massage Group		
Massage	Patient lying supine knees semi-flexed and head on pillow with proper height. - Diaphragmatic breathing training. **Extra-oral:** sliding, kneading, friction and trigger points release (ischemic compression) with cream and emphasis on the masseter, anterior temporalis and muscles of the neck as the upper trapezius and sternocleidomastoid, bilaterally. **Intra oral:** sliding, trigger points release (ischemic compression) and circular and transverse friction, with glove, on the masticatory muscles, with emphasis on the masseter, bilaterally.	Inspiration/Pause/ Expiration: 3:3:3 seconds 5 sets Isquemic Compression (maximum 60 seconds with 10-second rest between compressions) - 5 sets
Muscle Stretching Exercises	Patient lying supine knees semi-flexed and head on pillow. **Masticatory muscles:** Passive exercises with the help of the therapist (using gloves): elevators of the jaw (masseter, temporalis and medial pterygoid), retrusores (posterior temporal, digastric), lateral (contralateral lateral pterygoid) and circular movements of the jaw. Patient sitting, feet flat on the ground and spine aligned. **Muscles of the head and cervical spine:** Passive exercises with the help of the therapist: extensor (upper trapezius, levator scapulae, suboccipital), flexor (sternocleidomastoid and anterior scalene), lateral flexor (sternocleidomastoid, upper trapezius, middle and posterior scalenes, bilaterally) and rotators (upper trapezius and sternocleidomastoid contralateral), bilateral.	3 sets of 30 seconds Intervals between series of 10 seconds
Relaxation Group		
Progressive Muscle Relaxation	Patient sitting with feet and head supported. - Diaphragmatic breathing training. - 1st to 3rd session: contraction and relaxation of the muscle groups: arm, forearm and hands; frontal, eyes and nose; mouth and jaw. - 4th to 6th session: contraction and relaxation of the muscle groups: neck; shoulder; mouth and jaw. - 7th to 9th session: repeating sequence of previous sessions; - 10th to 12th session: complete sequence of the relaxation.	Inspiration/Pause/ Expiration: 3:3:3 seconds 5 sets Contraction/ Relaxation: 10:20 seconds- 2 sets of each muscle group
Imagination	Patient sitting with feet and head supported and closed eyes. Patient in relaxation (mostly jaws) and concentration in mental imagery of the scenes of your own, verbally guided by the therapist, with themes such as: - Sunset; - Clouds; - River; - Flowers; - Mountains; - Forest; - Beach; - Others.	3 scenes (6- 9 minutes each)

Figure 1: Physical therapy intervention protocols.

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Assessment

All participants underwent the same assessments at baseline, 6 weeks and 2-month post-initial intervention by a blinded assessor. At the 2-month follow-up, participants received educational material regarding the management of bruxism. Demographic and anthropometric data were collected, the severity of TMD (only myogenic, group I of RDC/TMD axis 1) [25] was assessed according to the Fonseca anamnesis index [26], severity of bruxism and parafunctional habits were evaluated using specified questionnaires [27], while cervical spine curvature with lateral radiographs [28].

Primary outcomes

Muscle pain and symptoms

Severity of pain in the masseter, anterior temporalis, upper trapezius, and sternocleidomastoid muscles and symptoms of headache, clenching, and sleep difficulties, at rest and moment of assessment, was assessed according to a 10-cm horizontal VAS with the labels 'no pain', 'absence', and 'no difficulty' on the left side and 'worst imaginable pain', 'maximum clenching', 'and no difficulty' on the right [28].

Pain threshold was evaluated using a digital algometer (Model FDX, Wagner Instruments, Greenwich, CT, USA) with a rubber extremity of 1-cm diameter. Increasing pressure (~1 kg/s) was applied perpendicularly over the bilateral trigger points of the masseter superficial fibers, anterior temporalis, upper trapezius, and sternocleidomastoid sternal division muscles. Trigger points of most tender were reported by participants upon digital pressure stimulation by a single examiner trained and marked with dermatographic pencil for assessment.

Pain threshold at each point was considered positive at values <2.6 kg/cm^2. Pain threshold reflects the lowest intensity of pressure at which an individual perceives pain [9,13,28].

Mandibular opening

It was measured using a digital pachymeter (Digimess®, São Paulo, Brazil). Reference points were defined by the maximum distance between the superior and inferior incisors at the midline. In adults, values <40 mm are considered limited [29].

Secondary outcomes

Anxiety

It was assessed according to the State-Trait Anxiety Inventory (STAI), which comprises two scales with 20 questions each for the evaluation of anxiety as state (at the moment) and trait (in general). Each scale is scored from 20 to 80. Anxiety is defined as: 20-34, low; 35-49, moderate; 50-64, high; and 65-80, very high [30].

Stress

It was assessed with the perceived stress scale (PSS-10), which comprises 10 questions. Total scores range from 0 to 40, with higher values suggesting higher stress level [31].

Depression

It was assessed according to the Beck depression inventory (BDI), which comprises 21 groups of depressive symptoms over the

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previous week. Depression is graded as: scores < 10, absent or minimal; 10–18, mild to moderate; 19–29, moderate to severe; ≥ 30, severe depression or scores ≤ 15, normality; 16 to 20, dysphoria; ≥ 21 indications of depression for absence of diagnosis of depression [30].

Sleep Quality

Over the preceding month, it was measured according to the Pittsburgh sleep quality index (PSQI), which comprises 19 questions grouped into 7 domains. Sleep quality is assessed as follows: scores of 0-4, good; 5-10, poor; and >10, sleep disorders [32].

Oral health

It was assessed according to the oral health impact profile (OHIP)–14, which comprises 14 questions. Total scores range from 0 to 56, with higher scores indicating poorer oral health [33].

Sample size

The sample size was designed to detect a two-point minimum difference among the groups in terms of pain intensity outcome measured by the VAS, assuming a standard deviation (SD) of two points [34,35].

Power was defined as 80% for an α-value of 5% and confidence interval (CI) of 95%. The required sample was set at 21 participants per group.

Randomization

Eligible participants were randomly assigned into one of three groups-the massage, relaxation, or dental group-according to a computer-generated randomization schedule, by a researcher who was uninvolved in participant recruitment, assessment or interventions. Allocation was concealed using consecutively numbered, sealed, opaque envelopes.

Data analysis

Data were summarized by descriptive statistics as mean ± SD or percentage. Normality of data distribution was determined by the Kolmogorov–Smirnov test. Intra and inter groups analysis were evaluated by two factor repeated-measures analysis of variance (ANOVA).

Post-hoc analysis was performed. Statistical analysis was performed on an intention-to-treat basis. Analyses were performed with the SPSS 19 (IBM, Chicago, IL) and SigmaPlot 13.0 (Systat Software Inc., San Jose, CA) software. Level of significance was set at 5%. The reduction of pain muscle intensity ≥ 30% was considered moderate and ≥ 50%, substantial [35].

Results

Seventy-two individuals were randomized and allocated to the massage, relaxation or dental groups (n=24, each) (Figure 2). There was similarity among groups for demographic and clinic characteristics at baseline (Table 1).

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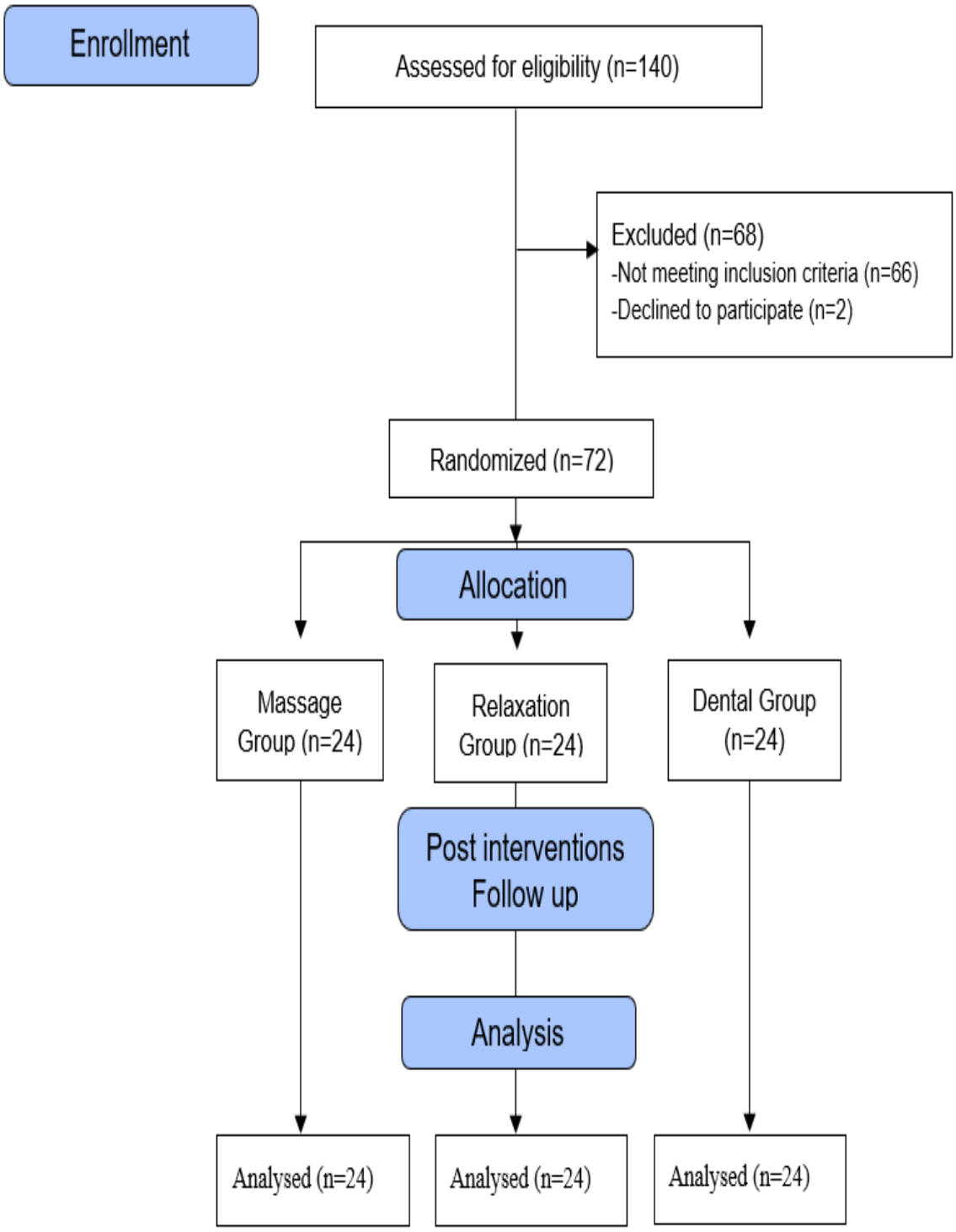

Figure 2: Design and flow of the study.

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Variable	Randomized (n=72)		
	G1 (n=24)	G2 (n=24)	G3 (n=24)
Participants			
Age, years	35 (10)	38 (12)	39 (11)
Weight, kg	67 (14)	73 (15)	68 (11)
Height, m	1.66 (0.09)	1.68 (0.11)	1.67 (0.08)
BMI, kg/cm²	24 (4)	26 (6)	24 (3)
Sex (Female)	18 (75)	17 (71)	16 (67)
Marital status			
Single	13 (55)	11 (46)	12 (50)
Married	8 (33)	10 (42)	11 (46)
Divorced	3 (12)	3 (12)	1 (4)
Level of education, years			
9-12	7 (29)	13 (54)	8 (33)
>12	17 (71)	11 (46)	16 (67)
Severity of TMD			
Mild (20-45)	6 (25)	5 (21)	2 (8)
Moderate (50-65)	7 (29)	11 (46)	12 (50)
Severe (70-100)	11 (46)	8 (33)	10 (42)
Severity of parafunctional habits			
Mild (3-5)	15 (62)	12 (50)	16 (67)
Moderate (6-10)	9 (38)	12 (50)	8 (33)
Severity of bruxism			
Moderate (6-10)	12 (50)	7 (29)	6 (25)
Severe (11-15)	12 (50)	17 (71)	18 (75)
Cervical curvature			
Lordosis	5 (21)	6 (25)	7 (29)
Rectification	11 (46)	12 (50)	12 (50)
Hyperlordosis	8 (33)	6 (25)	5 (21)

Table 1: Demographic and clinic characteristics of participants at baseline. Data are presented as mean ± standard deviation or number (%). G1, massage group; G2, relaxation group; G3, dental group; BMI, body mass index; TMD, temporomandibular disorder.

The intragroup analyses for primary and secondary outcomes are presented in Tables 2 and 3. Participants of all groups reduced intensity of teeth clenching; massage and relaxation groups exhibited improvement in intensity of muscle pain and symptoms, anxiety state, stress, depression and sleep quality; and only relaxation group increased anxiety trait at 6 weeks and 2 months post-initial intervention ($p<0.001$). After 6 weeks, relaxation group also improved oral health ($p<0.001$).

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Outcomes	Groups						Intragroup difference								
	Week 0			Week 6			Month 2			Week 0-Week 6			Week 0-Month 2		
	G1	G2	G3	G1	G2	G3	G1	G2	G3	G1	G2	G3	G1	G2	G3
	(n=24)	(n=24)	(n=24)	(n=24)	(n=24)	(n=24)	(n=24)	(n=24)	(n=24)	(n=24)	(n=24)	(n=24)	(n=24)	(n=24)	(n=24)
Pain / Symptoms, cm Masseter	5.9	6.1	6	2.5	2.3	4.9	2.7	2.1	4.7	3.4*	3.8*	1.1	3.2*	4*	1.3
	(2.5)	(2.2)	(3.1)	(2)	(2)	(2.8)	(1.7)	(1.9)	(2.4)	(3.4)	(2.2)	(3.5)	(3.1)	(1.9)	(2.9)
A. Temporal	7	5.7	6.1	2.6	1.8	4.3	2.4	1.9	4.5	4.4	3.9*	1.8*	4.6*	3.8*	1.6
	(2.6)	(2.4)	(2.7)	(2.4)	(2)	(2.5)	(1.8)	(2.5)	(2.6)	(3.4)	(3.2)	(3.6)	(3.3)	(3.6)	(2.9)
SCM	6.1	6	6	2.4	1.4	5.6	2.9	2.6	5.1	3.7*	4.6*	0.4	3.2*	3.4*	0.9
	(2.1)	(2.2)	(2.9)	(2)	(1.5)	(3)	(2.2)	(2.6)	(2.8)	(2.8)	(2.6)	(2.8)	(2.8)	(1.9)	(2.9)
U. Trapezius	7.9	6.6	7	3.7	2.1	6.6	3.1	3.1	5.9	4.2*	4.5*	0.4	4.8*	3.5*	1.1
	(2.1)	(1.9)	(2.5)	(2.8)	(2.2)	(2.9)	(2.3)	(2.3)	(2.7)	(3.2)	(2.5)	(2.2)	(2.9)	(1.9)	(1.7)
Headache	7.8	6.8	5.5	2.6	2.1	4.3	2.8	2.1	4.4	5.2*	4.7*	1.2	5*	4.7*	1.1
	(2.7)	(2.9)	(2.6)	(2.9)	(2)	(3.1)	(2.4)	(2.8)	(2.9	(3.1)	(2.7)	(2.7)	(3.1)	(3)	(2.9)
T. Clenching	8.2	7.5	8.4	3.9	1.9	6	3.2	3.4	6.2	4.3*	5.6*	2.4*	5*	4.1*	2.2*
	(2)	(2.2)	(1.6)	(3.1)	(1.7)	(2.8)	(2.4)	(2.6)	(2.8)	(3.4)	(2.4)	(2.1)	(2.9)	(2.3)	(2.1)
Sleep D.	6	6	5.3	2.7	2.2	4.5	2.2	2.6	4.2	3.3*	3.8*	0.8	3.8*	3.4*	1.1
	(2.6)	(3)	(3.8)	(2.8)	(2.1)	(3.5	(2.1)	(3)	(3.1)	(3)	(3)	(2.2)	(2.5)	(3.2)	(3.2)
Pain threshold, kg/cm² Masseter	1.13	1.12	1.07	1.27	1.24	1.14	1.21	1.19	1.21	0.14	0.12	0.04	0.08	0.07	0.14
	(0.5)	(0.5)	(0.3)	(0.4)	(0.4)	(0.3)	(0.3)	(0.4)	(0.4)	(0.5)	(0.4)	(0.2)	(0.4)	(0.4)	(0.3)
A. Temporal	1.3	1.22	1.21	1.51	1.38	1.26	1.36	1.44	1.36	0.21	0.16	0.03	0.06	0.22	0.15
	(0.5)	(0.4)	(0.5)	(0.5)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.6	(0.4)	(0.5)	(0.5)	(0.4)	(0.4)
SCM	1.14	1.24	1.18	1.48	1.51	1.28	1.46	1.45	1.27	0.34	0.27	0.1	0.32	0.21	0.09
	(0.4)	(0.5)	(0.4)	(0.3)	(0.5)	(0.4)	(0.5)	(0.4)	(0.5)	(0.4	(0.5)	(0.4)	(0.5)	(0.5)	(0.5)
U. Trapezius	1.58	1.6	1.54	2.01	1.9	1.61	1.82	1.9	1.74	0.43	0.32	0.07	0.24	0.35	0.2
	(0.6)	(0.7)	(0.6)	(0.7)	(0.5)	(0.5)	(0.7)	(0.5)	(0.6)	(0.8	(0.6)	(0.5)	(0.9)	(0.7)	(0.5)
Mandibullar O,mm	49.1	47.1	47	50.9	49.1	47.3	49.9	49.5	46.9	1.8	2	0,3	0.8	2.4	(0.1
	(5.7)	(6.6)	(8.7)	(5.9)	(5.6)	(7.5)	(5.2)	(6.9)	(7.4)	(3.5	(6.1)	(3.9)	(3.5)	(6.7)	(3.4)

Table 2: Intragroup comparisons for primary outcomes at baseline, 6 weeks and 2-month post-initial intervention. Data are presented as mean ± standard deviation. *p<0.05. SD: standard deviation; A: Anterior; SCM: sternocleidomastoid; U: Upper; T: Teeth; D: Difficulties; O: Opening; G1: massage group; G2: relaxation group; G3: dental group.

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Outcomes	Groups						Intragroup difference								
	Week 0			Week 6			Month 2			Week 0-Week 6			Week 0-Month 2		
	G1	G2	G3	G1	G2	G3	G1	G2	G3	G1	G2	G3	G1	G2	G3
	(n=24)	(n=24)	(n=24)	(n=24)	(n=24)	(n=24)	(n=24)	(n=24)	(n=24)	(n=24)	(n=24)	(n=24)	(n=24)	(n=24)	(n=24)
Anxiety (20-80) State	52.3	51.4	51.2	44.9	43.8	51.7	44.6	43.9	50.4	7.4*	7.6*	-0.5	7.7*	7.5*	0.8
	(9.5)	(9.8)	(12.4)	(11.2)	(10)	(10.3)	(10.8)	(10.7)	(10.6)	(10.7)	(7.3)	(7)	(9.7)	(8.2)	(6.2)
Trait	50.4	50.9	46	45.5	42.9	46.7	44.3	41.9	45.1	4.9	8*	-0.7	6.1	9*	0.9
	(7.20)	(8.2)	(8.9)	(11.5)	(9.9)	(9.1)	(10.1)	(10.5)	(9.1)	(9.5)	(6.9)	(5.9)	(8.7)	(7.4)	(4.5)
Stress (0-40)	25	22.6	21.2	19.5	17.5	23.5	18.4	17	24.5	5.5*	5.1*	-2.3	6.6*	5.6*	-3.3
	(2.9)	(4.5)	(6.2)	(6.2)	(6)	(5.7)	(4.3)	(6.5)	(5.6)	(5.1)	(5.2)	(5.2)	(3.8)	(4.8)	(3.9)
Depression (0-63)	16.7	16.7	15.3	9.8	7.6	16	7.6	7.8	14.9	6.9*	9.1*	-0.7	9.1*	8.9*	0.4
	(3.2)	(5.7)	(8.2)	(6.2)	(5.4)	(6.4)	(4.8)	(6.6)	(8.3)	(5.9)	(5.4)	(4.9)	(5.9)	(5.9)	(4.7)
Oral health (0-56)	22.3	22.3	21.7	19	15.6	20.8	18.8	17.9	21.7	3.3	6.7*	0.9	3.5	4.4	0
	(7.7)	(9.2)	(10)	(8.8)	(9.8)	(10)	(8.1)	(12.1)	(10.7)	(6.8)	(6.5)	(7.4)	(6.8)	(6.8)	(6.9)
Sleep (0-21)	11	11	10.2	6	6.4	10.1	6.3	6.8	8.7	5*	4.6*	0.1	4.7*	4.2*	1.5
	(2.5)	(1.9)	(2.3)	(3.1)	(3.3)	(2.7)	(2.5)	(3.9)	(2.8)	(2.8)	(3.3)	(3.3)	(2.9)	(3.5)	(2.9)

Table 3: Intragroup difference for secondary outcomes at baseline, 6 weeks and 2-month post-initial intervention. Data are presented as mean ± standard deviation. *p<0.05; G1: massage group; G2: relaxation group; G3: dental group.

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At 6 weeks and 2 months post-initial intervention, the proportions of patients with ≥ 30% reduction in muscle pain intensity in the massage, relaxation, and dental groups were: masseter, 8-17%, 8-4%, and 13-21%; anterior temporalis, 21-13%, 17%, and 13-21%; sternocleidomastoid, 13%, 13-17%, and 13-17%; and upper trapezius, 13-21%, 21-13%, and 0-17%, respectively; while proportions of patients with ≥ 50% reduction were: masseter, 67-58%; 79-88%, and 46-33%; anterior temporalis, 67-71%, 75%, and 33-54%; sternocleidomastoid, 63-75%, 71-79%, and 29%; and upper trapezius, 63-67%, 67%, and 21-29%, respectively. The intergroup analysis is presented in Table 4.

Massage and relaxation groups resulted in a greater positive effect on the intensity of muscle pain, symptoms, anxiety, stress, depression, and sleep quality than dental group at 6 weeks and 2 months post-initial intervention (p<0.001). The relaxation group exhibited greater improvement in oral health (p<0.001).

Since there was no difference between the sides, only pain threshold on the left side was presented in Tables.

Outcomes	p	Week 6 - Week 0			Month 2 - Week 0		
		G1 - G2	G1 - G3	G2 - G3	G1 - G2	G1 - G3	G2 - G3
Pain / Symptom, cm Masseter	p<0.001	-0.4 (-2.1–1.3)	2.3* (0.2–4.4)	2.7* (0.9–4.4)	-0.8 (-2.2–0.6)	1.9* (0.1–3.7)	2.7* (1.2–4.2)
Anterior temporal	p<0.001	0.5 (-1.4–2.4)	2.6* (0.5–4.7)	2.1* (0.1–4.1)	0.8 (-1.2–2.8)	3* (1.1–4.9)	2.2* (0.2–4.2)
SCM	p<0.001	-0.9 (-2.5–0.7)	3.3* (1.6–4.9)	4.2* (2.6–5.8)	-0.2 (-1.6–1.2)	2.3* (0.6–4)	2.5* (1–4)
Upper trapezius	p<0.001	-0.3 (-1.9–1.4)	3.8* (2.1–5.5)	4.1* (2.3–5.5)	1.3 (-0.1–2.7)	3.7* (2.2–5.2)	2.4* (1.3–3.5)
Headache	p<0.001	0.5 (-1.4–2.4)	4* (2.2–5.8)	3.5* (1.9–5.1)	0.3 (-1.5–2.1)	3.9* (2.1–5.7)	3.6* (1.8–5.4)
Teeth clenching	p<0.001	-1.3 (-3–0.4)	1.9* (0.2–3.6)	3.2* (1.8–4.6)	0.9 (-0.6–2.4)	2.8* (-0.9–6.5)	1.9* (0.6–3.2)
Sleep difficulties	p<0.001	-0.5 (-2.2–1.2)	2.5* (0.9–4.1)	3* (1.4–4.6)	0.4 (-1.3–2.1)	2.7* (1–4)	2.3* (0.4–4.2)
Pain threshold, kg/cm² Masseter	p=0.837	0.02 (-0.2–0.3)	0.1 (-0.1–0.3)	0.08 (-0.1–03)	0.01 (-0.2–0.2)	-0.06 (-0.3–0.2)	-0.07 (-0.3–0.2)
Anterior temporal	p=0.348	0.05 (-0.3–0.4)	0.18 (-0.2–0.5)	0.13 (-0.1–0.4)	-0.16 (-0.4–0.1)	-0.09 (-0.4–0.2)	0.07 (-0.2–0.3)
SCM	p=0.283	0.07 (-0.2–0.3)	0.24 (0–0.5)	0.17 (-0.1–0.4)	0.11 (-0.2–0.4)	0.23 (-0.1–0.5)	0.12 (-0.2–0.4)
Upper trapezius	p=0.084	0.11 (-0.3–0.5)	0.36 (-0.1–0.8)	0.25 (-0.1–0.6)	-0.11 (-0.6–0.4)	0.04 (-0.4–0.5)	0.15 (-0.2–0.5)
Mandibular opening, mm	p=0.008	-0.2 (-3.1–2.7)	1.5 (-0.6–3.6)	2 (-1.2–5.1)	-1.6 (-4.7–1.5)	0.8 (-1.3–2.9)	2.4 (-0.9–5.7)
Anxiety state (20-80)	p<0.001	-0.2 (-5.5–5.1)	7.9* (2.4–13.4)	8.1* (3.8–12.4)	0.2 (-5–5)	6.9* (1.9–11.9)	6.7* (2.3–11.1)
Anxiety trait (20-80)	p<0.001	-3.1 (-7.9–1.7)	5.6* (0.8–10.4)	8.7* (4.8–12.6)	-2.9 (-7.6–1.8)	5.2* (0.9–9.5)	8.1* (4.4–11.9)

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Stress (0-40)	p<0.001	0.4 (-2.6–3.4)	7.8* (4.7–10.9)	7.4* (4.3–10.5)	1 (-1.5–3.5)	9.9* (7.6–12.2)	8.9* (6.3–11.6)
Depression (0-63)	p<0.001	-2.2 (-5.5–1.1)	7.6* (4.3–10.9)	9.8* (6.7–12.9)	0.2 (-3.2–3.6)	8.7* (5.5–11.9)	8.5* (5.3–11.7)
Oral health (0-56)	p<0.001	-3.4 (-7.3–0.5)	2.4 (-1.9–6.7)	5.8* (1.6–9.9)	-0.9 (-4.9–3.1)	3.5 (-0.6–7.6)	4.4* (0.3–8.5)
Sleep (0-21)	p<0.001	0.4 (-1.4–2.2)	4.9* (3.1–6.7)	4.5* (2.5–6.5)	0.5 (-1.4–2.4)	3.2* (1.5–4.9)	2.7* (0.8–4.7)

Table 4: Intergroup differences in primary and secondary outcomes. Data are presented as mean (95% confidence interval). VAS, visual analogue scale, SCM, sternocleidomastoid, G1, massage group, G2, relaxation group, G3, dental group. *p < 0.05 between groups.

Discussion

Individuals with bruxism who received physical therapy-either massage with stretching exercises or relaxation with imagination therapy-exhibited a significant decrease in muscle pain and symptoms as well as improvement in anxiety, stress, depression and sleep quality at 6 weeks and 2 months post-initial intervention. After 6 weeks, only relaxation group improved oral health. With regard to the clinical effect of treatment, the physical therapy groups presented greater proportions of individuals with substantial reduction in pain intensity than the dental group [35]. Both physical therapy interventions exhibited greater efficacy than dental treatment in terms of both primary and secondary outcomes, with the exception of oral health, which was found to have improved only in the relaxation group. There were significant differences in treatment outcomes between the physical therapy and dental groups at 6 weeks and 2 months post-initial intervention. Therefore, massage therapy with stretching exercises and relaxation with imagination therapy are effective and beneficial for individuals with bruxism in concordance with initial hypothesis.

The results of this trial are consistent with previous studies. Relaxation therapy, therapeutic exercises with cognitive behavior therapy, therapeutic exercises, cognitive behavior therapy, transcutaneous electrical and micro current nerve stimulation, biofeedback (BF) by electromyography (EMG) have been reported to decrease masticatory muscle pain in bruxism [2,11,13,15,17,20].

Although, another study reported that simple massage therapy does not reduce the intensity of muscle pain, as combined with splint therapy decrease this symptom, probably due to the release of trigger points, increased local blood flow, and muscle relaxation in individuals with masticatory muscle pain and bruxism [16]. Stretching exercises and manual therapy have been shown to reduce headache and teeth clenching in bruxism, maybe by increasing patient awareness, thus contributing to symptom management [28].

In previous studies, low threshold pain associated with bruxism was alleviated with transcutaneous electrical and micro current nerve stimulation but not with BF by EMG [9,13], similarly to this study. Assessment of pain threshold at trigger points of most

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tender and not at specific locations might have contributed to the results of the present study. However, these trigger points were determined by a single examiner trained. Moreover, this method has been commonly used in studies on bruxism and myofascial pain [9,13,28].

In the present study, the physical therapy groups exhibited a greater improvement in anxiety, stress, depression and sleep quality than the dental group probably due to improvement in muscle pain and symptoms intensities. These findings correspond with study that reported the improvement of anxiety in children with bruxism by the muscle relaxation [17]. The present findings also correspond with those of previous studies that reported the improvement of stress and depression with progressive muscle relaxation similarly to splint therapy [18], but not with BF in individuals with sleep bruxism [6,8]. Moreover, in contrast, other studies do not demonstrated improvement of sleep quality of individuals with sleep bruxism treated with BF [7,8].

The improvement in oral health observed between the relaxation and dental groups in this study, corresponds or not with the findings of previous studies that investigated oral health with BF in individuals with sleep bruxism, using the original version of OHIP [6,8]. The OHIP-14 used in the present study includes question regarding psychological discomfort, which is one of the relevant subscales for determining the negative impact of oral health [33]. This aspect might have contributed to the improvement in oral health observed in the relaxation group.

In the present study, although the baseline mandibular opening have suggested that individuals with myogenic TMD were of group Ia of RDC/TMD axis 1 (without limitation) [25], physical therapy interventions resulted in an increase of mandibular opening without difference relative to dental treatment, which corresponds with the results of previous studies involving therapeutic exercises with cognitive behavior therapy and muscle relaxation with imagination therapy and muscle stretching exercises [15,20]. However, other studies involving BF by EMG have not reported similar results in sleep bruxism [6,8].

Although physical therapy is crucial for the treatment of pain and bruxism, referral of individuals with bruxism to physical therapists is not a common practice. In this context, the greatest advantage of the present study is its randomized trial design, which allowed the comparison of efficacy between physical therapy interventions and dental treatment in individuals that sought treatment for bruxism. Therefore, the present findings might help reevaluate and modify current clinical practices and educate healthcare professionals dealing with bruxism. Although all possible methodological precautions were taken to minimize the possibility of bias, the nature of interventions precluded the blinding of the dentist, therapists, and participants, which could be perceived as a limitation of this study [22].

The positive effect of physical therapy on different outcomes suggests that the best therapeutic approach to ensure maximum improvement of the clinical manifestations of

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bruxism is physical therapy interventions based on biobehavioral approaches. Therefore, it is important that an interdisciplinary team comprising physiotherapists and dentists evaluates the symptoms of bruxism in individuals in order to provide better recommendations regarding management and treatment [3,4,5,15-21]. Future studies involving interventions physical therapy with concomitant integration of biological and psychosocial factors, inclusive dental treatment, might help better represent current clinical practices and evaluate the actual impact of physical therapy

The findings of the present trial indicate that two physical therapy interventions are superior to dental treatment in improving muscle pain, symptoms, anxiety, stress, depression and sleep quality in individuals with bruxism. Relaxation with imagination therapy is more effective than dental treatment in the management of oral health in bruxism.

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