

Oral motor rehabilitation for temporomandibular joint disorders: a systematic review

Tratamento para disfunções temporomandibulares: uma revisão sistemática

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ABSTRACT

Introduction: Disorders of TMJ are complex and multifactorial. Studies comparing different treatment methods are found in the literature. **Purpose:** To verify the effectiveness of muscle and orofacial myofunctional rehabilitation for temporomandibular joint disorders (TMJ). **Research strategy:** This qualitative review of the literature analyzed international scientific publications in PubMed database that used the following keywords: temporomandibular disorders and oral motor therapy; orofacial myofunctional therapy and temporomandibular disorders; temporomandibular disorders and myofunctional rehabilitation. Our investigation was limited to articles published in English or Portuguese languages, between January 2006 and December 2016. **Selection criteria:** Scientific publications about rehabilitation strategies for TMJ associated to muscle exercises and/or manual therapy were included. The publications that did not present access to the full text, that were repeated by overlapping keywords, case studies, letters to the editor and those that were not directly related to the topic of investigation were excluded. **Results:** One hundred and two studies were identified out of which 22 matched our inclusion criteria. Overall, most of the treatments described in the investigated studies presented positive outcomes for the patients with TMJ. The studies presented a wide variability in terms of treatment proposals and methodology used to verify treatment effectiveness. A very small number of studies included control groups. Combined techniques (e.g. exercises associated to the use of equipment to reduce pain) produced better therapy effects, with greater pain reduction and improved mandibular mobility. **Conclusion:** Although we observed a growing number of publications about TMJ rehabilitation, the best therapeutic technique and its real benefits remains unclear.

Keywords: Temporomandibular joint; Therapeutics; Review

RESUMO

Introdução: A disfunção temporomandibular (DTM) é complexa e multifatorial. São encontrados, na literatura, estudos que comparam diferentes métodos de tratamento. **Objetivo:** Investigar estudos sobre o tratamento das disfunções temporomandibulares (DTMs) nas diversas áreas da saúde, avaliando a eficácia das técnicas empregadas, principalmente no que se refere ao uso da terapia miofuncional orofacial. **Estratégia de pesquisa:** Os artigos compilados neste estudo foram selecionados por meio da base de dados PubMed, utilizando os descritores “temporomandibular disorders and oral motor therapy”, “orofacial myofunctional therapy and temporomandibular disorders” e “temporomandibular disorders and myofunctional rehabilitation”. O levantamento realizado limitou-se aos artigos publicado nos idiomas Inglês e Português, entre janeiro de 2006 e dezembro de 2016. **Crerios de seleção:** Foram incluídos artigos sobre os tratamentos das DTMs associados aos exercícios musculares e/ou terapias manuais. Publicações sem acesso completo, repetidas por sobreposição das palavras-chave, revisões de literatura, cartas ao editor e não relacionadas diretamente ao tema foram excluídas. **Resultados:** Dos 102 estudos selecionados, 22 atenderam aos critérios estabelecidos. Em geral, a maioria dos tratamentos descritos apresentou efeitos benéficos para pacientes com DTMs. Foi observada grande variabilidade da metodologia adotada para a aplicação e verificação dos efeitos dos tratamentos e somente poucos estudos fizeram uso de grupo controle. **Conclusão:** Apesar do crescimento no número de pesquisas sobre DTMs, ainda não é possível estabelecer qual a melhor técnica de tratamento. Após análise dos artigos selecionados, observou-se que as técnicas combinadas de terapia (ex.: exercício associado ao uso de equipamento para redução da dor) produzem melhores resultados, com maior redução da dor e melhora da mobilidade mandibular.

Palavras-chave: Articulação temporomandibular; Terapêutica; Revisão

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INTRODUCTION

The temporomandibular joint (TMJ) operates in a complex way. It is the only mobile joint of the skull, and it has a bicondylar structure, thus enabling rotational and translational movements^(1,2). The TMJ is susceptible to unfavorable conditions, since it needs to accommodate occlusal, muscular, and cervical adjustments. Therefore, imbalance in the TMJ can result in joint and/or muscular dysfunction^(1,2).

The term “temporomandibular disorder” (TMD) is recognized by the American Association of Dental Research as a group of musculoskeletal and neuromuscular conditions involving the TMJ, masticatory muscles, and all associated tissues⁽³⁾. TMDs can have many causes, including predisposing, trigger, and perpetuating factors, such as occlusal changes, parafunctional habits, stress, anxiety, or intra-articular disk abnormalities. Such factors may be related to articular inflammation, damage and muscle aches, or spasms⁽⁴⁾. The most common signs and symptoms include joint noises, headache, pain in the pre-auricular region, otalgia, face and cervical pain, muscle fatigue, deviation of the jaw’s trajectory during the movement, limitation in mouth opening, and tooth sensitivity, all of which can cause great discomfort and loss of quality of life^(5,6).

Regarding sex distribution, TMDs are more common among women than among men⁽⁷⁾. The predominant symptoms are neck and shoulder pain, pain in the facial muscles and TMJ, and finally headache⁽⁷⁾. In a study involving TMDs in the Mexican population, 46.9% of participants presented with joint disc displacement of the TMJ. This was the most common symptom, followed by muscle disorders⁽⁸⁾. In another study focusing on TMD and dental occlusion, the authors showed that occlusal interferences can lead to dysfunctions in the TMJs, causing changes in mandibular movement and muscle functions⁽⁹⁾.

Existing treatments for TMDs vary widely, and clinical diagnosis by a specialist is essential to ensure the most appropriate treatment. Furthermore, because TMDs have many causes, the first plan of treatment should be conservative, reversible, and non-invasive^(3,5,10). In particular, self-care approaches, psychological interventions, pharmacological therapy, physical therapy, acupuncture, laser therapy of low intensity, occlusion, muscle exercises, and manual therapies may be applied⁽¹⁰⁾. Similarly, speech therapy should adopt conservative practices in the treatment of TMDs. Specifically, patients carry out orofacial myofunctional exercises to balance the orofacial musculature and thus facilitate oral functions, such as chewing. Speech therapy aims to rehabilitate the function of the orofacial muscles, assisting them towards a balanced operation. This therapy functions by reducing the overburden that comes from orofacial muscle adaptations and compensations that which aggravate or perpetuate TMD. Moreover, in the treatment of TMD, this therapy includes

strategies that are intended to reduce pain and to adapt the range of movement of the mandible, which is crucial in the functional recovery of the orofacial muscle system⁽¹¹⁾.

Currently, several studies, in various fields of healthcare, have compared different methods of treating TMDs. However, although orofacial muscle exercises are part of the orofacial myofunctional therapy performed by speech therapists, few studies have compared and discussed the techniques, frequency, and effectiveness of the exercises⁽¹²⁾.

OBJECTIVES

The objective of this study was to perform a systematic review of TMD treatment in various healthcare areas, evaluating the effectiveness of the techniques employed, with particular attention to the use of orofacial myofunctional therapy.

RESEARCH STRATEGY

The precepts of the *Cochrane Handbook for Systematic Reviews of Interventions*⁽¹³⁾ were followed to establish the research method. The articles compiled in this study were selected via the PubMed database using the following descriptors: “temporomandibular disorders and oral motor therapy,” “orofacial myofunctional therapy and temporomandibular disorders,” and “temporomandibular disorders and myofunctional rehabilitation.” The scope of the research was limited to articles in Portuguese and English published between January 2006 and December 2016.

To avoid overlooking any studies, three researchers independently conducted the search for articles in the database. Only those texts that were directly related to the present research were analyzed. All stages of the research were conducted independently by the researchers.

SELECTION CRITERIA

We included articles that investigated TMD treatments involving muscle exercises and/or manual therapies, or articles that described the use of appliances and devices to treat TMD. Articles in languages other than Portuguese or English were excluded, as were articles that did not allow access to the full text and articles that were repeated due to overlapping of the keywords. From the complete texts that were selected, literature reviews, letters to the editor, and texts that were not directly related to the topic were excluded. When there was disagreement among the researchers, the texts were only included when the final position was unanimous.

DATA ANALYSIS

All selected articles were analyzed in terms of the following items: case-by-case assessment, age and sex of participants,

main health disorder, research objective, techniques used, and results/conclusion.

RESULTS

Of the 102 selected articles, 28 met the inclusion criteria and were considered for analysis in the present study. Of these, three could not be accessed and three were repeated, leaving 22 articles available for review (Figure 1).

For the purposes of analysis, the articles were divided based on areas of specialty, as shown in the following charts: Chart 1—articles from the dentistry field; Chart 2—articles from the speech therapy field; Chart 3—articles from the physiotherapy field; Chart 4—reports of a clinical case.

DISCUSSION

In general, after the selected studies from all areas were analyzed, TMDs were found to have a higher prevalence among women. However, none of the articles differentiated the groups based on the sex of the participants to analyze the results. Although the reason for the higher prevalence of TMD among women is not known, estrogen has been identified as a risk factor^(35,36,37,38,39,40).

Among the articles from the dentistry field, the age of the participants was similar, varying between 20 and 55 years (adults and young elderly people). Two of the studies involved the use of occlusal splints^(14,16), and another one implemented an exercise protocol⁽¹⁵⁾. The techniques used, and a description of the therapies, were detailed in all articles. Only in the study by Truelove et al.⁽¹⁴⁾ was there any long-term monitoring of patients, with evaluation of results after 3 and 12 months of treatment. The other authors^(15,16) only presented the pre-intervention and immediate post-intervention data. With regard to the methods used for assessment and reassessment of patients, all studies used evaluation protocols that were already published, such as the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD), plus surface electromyography (SEMG)⁽¹⁵⁾, imaging scans, and measurement of mandibular range⁽¹⁶⁾.

In this field, no relevant differences were found between the different therapeutic approaches. One study indicated that chewing gum as exercise reduced pain⁽¹⁵⁾ in patients with TMD. However, the study only used pre-treatment and immediate post-treatment assessment. Thus, it could not confirm whether the results were maintained in the long term. The same study⁽¹⁵⁾ divided participants into groups with different alterations: one with muscle alterations and another with joint alteration. In both groups, the use of an occlusal splint eliminated pain and improved masticatory function and mandibular mobility. There was no significant difference between the groups in this regard.

In the speech therapy field, the age range of the study participants was wider than in the dentistry studies, varying between 13 and 68 years of age (teenagers, adults, and the elderly). The individual cases used in the studies varied widely, and only one of the studies contained more than 80 participants⁽¹²⁾. Some studies used both patients with TMD and healthy individuals as control groups^(12,17,18).

With regard to the treatment techniques investigated by speech therapy, two of the studies examined the effects of orofacial myofunctional therapy in reducing the signs and symptoms of TMD^(17,18), two studies examined the effects of low-intensity laser with or without myofunctional orofacial therapy^(12, 20), and two studies presented a detailed description of the adopted myofunctional therapy protocol^(18, 19). In general, the methodology of the studies reported the objectives of the exercises (to increase circulation, relieve pain, improve coordination of orofacial musculature, improve the strength and breadth of the mandibular movements, and so on).

Most studies in this area evaluated only the pre-intervention and immediate post-intervention data. Individuals were monitored long term only in the studies of Melchior⁽²⁰⁾ and Machado⁽¹²⁾. As a method of evaluation, all the articles used protocols already published in the literature and widely used in the field. Orofacial myofunctional therapy was associated with a significant improvement in pain (mostly on palpation), a reduction in otological symptoms, a decreased muscle asymmetry index, and an improvement in mandibular mobility and orofacial function in general. The isolated use of laser

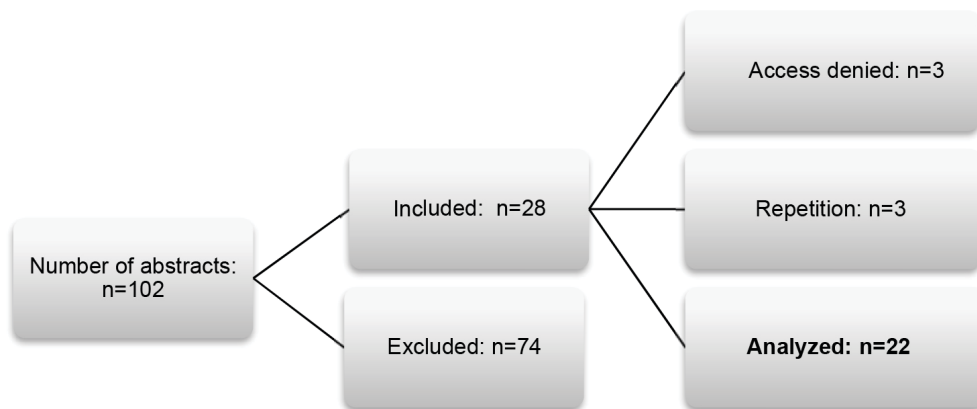


Figure 1. Selection of the articles included in the research

Chart 1. Treatment for temporomandibular disorders—dentistry field

Reference	Title	Considerations of the cases	Age	Sex	Main disorder	Study objectives	Used techniques	Result/conclusion
Truelove et al., 2006 ⁽¹⁴⁾	<i>The efficacy of traditional, low-cost and non-splint therapies for temporomandibular disorder: a randomized controlled trial</i>	Conventional treatment: 64 patients Treatment with acrylic splint: 68 patients Treatment with thermoplastic vinyl splint: 68 patients	23–47 years	Both	TMD and myofascial pain	To investigate whether the use of two different types of occlusal splint combined with conventional therapy contributes to pain reduction and TMD symptoms (opening noise, crepitus, tinnitus, daytime and nighttime clenching, alterations of chewing function)	Conventional treatment: mandible relaxation, reduction of parafunctional habits, thermotherapy, and passive stretching of the muscles Treatment with an acrylic splint: conventional treatment combined with the use of an acrylic splint Treatment with a thermoplastic vinyl splint: conventional treatment combined with the use of a thermoplastic splint	There were no differences among the treatments; all were equally effective in reducing pain and TMD symptoms
Gavish et al., 2006 ⁽¹⁵⁾	<i>Effect of controlled masticatory exercise on pain and muscle performance in myofascial pain patients: a pilot study</i>	Conventional treatment: 10 patients Treatment with chewing gum: 10 patients	20–45 years	Female	TMD and myofascial pain	To verify whether controlled chewing exercises improve muscle function and reduce the level of pain in patients with TMD	Conventional treatment: guidance on the TMD and the effects of parafunctional habits Treatment with gum: patients were advised to chew two pieces of sugarless gum three times a day as follows: weeks 1 and 2—10 minutes; weeks 3 and 4—15 minutes; weeks 5 and 6—20 minutes; weeks 7 and 8—30 minutes	Both groups showed a reduction in myofascial pain, and the group treated using chewing gum demonstrated greater pain reduction. No improvement in muscle performance was observed in either group.

Chart 1. Treatment for temporomandibular disorders—dentistry field (cont.)

Reference	Title	Considerations of the cases	Age	Sex	Main disorder	Study objectives	Used techniques	Result/conclusion
Kümbüloğlu et al., 2013 ⁽¹⁶⁾	<i>Clinical study on the comparison of masticatory efficiency and jaw movement before and after temporomandibular disorder treatment</i>	Unilateral muscular alteration: 20 patients Unilateral alteration of articular disk: 20 patients Individuals without alterations: 20 patients	20–55 years	Both	TMD and myofascial pain	To compare pre-treatment with post-treatment results in different groups, after therapy with an occlusal splint	The treatment in the patient groups was the full-time use of an occlusal acrylic splint for 6 weeks The group of individuals without alterations was evaluated just once.	The use of an occlusal splint eliminated muscle pain, joint pain, and headaches; it also improved mastication, reduced crepitus and noises, and improved the maximum oral opening in both groups of patients.

Caption: TMD = temporomandibular disorder

Chart 2. Treatment of temporomandibular disorders—speech therapy field

Reference	Title	Considerations of the cases	Age	Sex	Main disorder	Study objectives	Used techniques	Result/conclusion
Felício et al., 2008 ⁽¹⁷⁾	<i>Otologic symptoms of temporomandibular disorder and effect of orofacial myofunctional therapy</i>	TMD: 20 patients—10 treated using orofacial myofunctional therapy and 10 in the control group Asymptomatic group: eight individuals with no signs or symptoms of TMD	Average of 31 years and 46 months	Female	Joint TMD	To investigate the frequency of otologic symptoms, the relationship between these symptoms and orofacial signs and symptoms of TMD, and the effectiveness of orofacial myofunctional therapy on the frequency and seriousness of these symptoms.	Purpose of the orofacial myofunctional therapy: increase local blood circulation and relieve pain, improve mandibular posture and mobility, improve co-ordination of the muscles of the stomatognathic system as well as the balance of stomatognathic functions, between nine and 13 sessions of 45 minutes each, weekly during the first 30 days and every two weeks thereafter. The other groups performed only the evaluations.	TMD groups presented a higher incidence of otologic symptoms, mainly otalgia and tinnitus. These symptoms were related to pain on palpation and with the severity of orofacial signs and symptoms. The group which followed orofacial therapy presented significant improvement of the signs and symptoms of TMD, particularly the otologic symptoms and muscle asymmetry index.

Chart 2. Treatment of temporomandibular disorders—speech therapy field (cont.)

Reference	Title	Considerations of the cases	Age	Sex	Main disorder	Study objectives	Used techniques	Result/conclusion
Felício, Oliveira e Silva, 2010 ⁽¹⁸⁾	<i>Effects of orofacial myofunctional therapy on temporomandibular disorders</i>	TMD group: 30 subjects with TMD—10 in the myofunctional therapy group, 10 in the occlusion splint group, and 10 in the symptomatic control group. Group without TMD: 10 individuals	TMD group: 13–43 years for myofunctional therapy, 17–64 years for occlusal splint, and 14–63 years for the symptomatic control group without TMD: 18–68 years	Female	Long-term muscular and joint TMD: average of 74 months and 4 days	To analyze the effect of myofunctional therapy in individuals with chronic joint and muscular orofacial TMD. Clinical protocols were used to determine whether the therapy promotes remission and/or muscular and joint pain reduction, improvement in mandibular mobility, improvement in the Helkimo index, remission or reduction in the frequency and severity of the symptoms of TMD and myofunctional changes.	TMD group: Objectives— to relieve pain, improve mandibular posture and mobility, promote muscle symmetry, improve muscle co-ordination in the stomatognathic system and balance stomatognathic functions Exercises described in the appendix of the article. 120 days—45 minutes each session, weekly during the first 30 days and every two weeks thereafter; patients were instructed to perform the exercises at home Occlusal splint: continuous use during the first 15 days, followed by nighttime use after this period, for a total treatment time of 45 days	Myofunctional therapy showed positive effects, with significant reduction in the severity of pain on palpation (muscular only), increased mandible mobility, reduction in Helkimo index, reduction in the frequency and severity of TMD signs and symptoms, and improvement in orofacial myofunctional conditions
Richardson et al., 2012 ⁽¹⁹⁾	<i>The effect of oral motor exercises on patients with myofascial pain of masticatory system. Case series report</i>	Three patients with TMD	28, 28, and 56 years	Female	Muscular TMD	To present three case studies of patients who reported myofunctional pain and who had received multidisciplinary treatment with a program of oral motor exercises	Three to four oral motor therapy sessions, with the objective of increasing lips, jaw, and tongue mobility, improving the strength and range of motion. The exercises are described in the text.	The therapy was beneficial, with reduction in pain and improvement in the masticatory function.
Melchior et al., 2012 ⁽²⁰⁾	<i>Does low intensity laser therapy reduce pain and change orofacial myofunctional conditions?</i>	12 individuals	18–60 years	Female	Myofascial pain with or without intraarticular TMD	To verify whether the application of low-intensity laser helps decrease pain, to evaluate whether orofacial myofunctional changes occur, and to check whether the remission of pain remains for 30 days after the treatment	Laser: doses of 60 mW over 40 seconds, held twice a week for four weeks.	Laser therapy promoted instant relief from pain; however, it was not effective in the long run. Pain reduction was not enough to introduce orofacial myofunctional changes.

Chart 2. Treatment of temporomandibular disorders—speech therapy field (cont.)

Reference	Title	Considerations of the cases	Age	Sex	Main disorder	Study objectives	Used techniques	Result/conclusion
Machado et al., 2016 ⁽¹²⁾	<i>Effects of oral motor exercises and laser therapy on chronic temporomandibular disorders: a randomized study with follow-up</i>	82 patients with TMD: 21 in GI (laser therapy) + myofunctional therapy), 22 in GII (myofunctional therapy), 21 in GIII (placebo and myofunctional therapy), 18 in GIV (laser therapy) and 20 without TMD in the control group: GC	GC: 21–39 years GI: 23–49 years GII: 21–45 years GIII: 18–46 years GIV: 22–46 years	Both	TMD and pain	To compare a low-intensity laser/myofunctional therapy combination with the isolated treatments and with a placebo treatment	Laser: 60 mW over 40 seconds; bilateral application on the condyle, masseter, and temporal region Myofunctional therapy: instructions and guidance on TMD, strategies for pain reduction using heat therapy, massage, and relaxation, myofunctional exercises for the tongue, lips, cheeks, and jaw, and orofacial myofunctional training; 45-minute sessions, totaling a maximum of nine sessions, weekly at the beginning and then every 2 weeks after 30 days	The combination of techniques was more effective in TMD rehabilitation than the laser technique alone. However, it was not better than the full myofunctional therapy protocol (exercises associated with strategies such as relaxation, hot compresses, and massage techniques)

Caption: TMD = temporomandibular disorder

Chart 3. Treatment of temporomandibular disorders—physiotherapy field

Reference	Title	Considerations on the cases	Age	Sex	Main disorder	Study objectives	Used techniques	Result/conclusion
Piekartz, Hall., 2013 ⁽¹⁾	<i>Orofacial manual cervical movement impairment associated with headache and features of temporomandibular dysfunction: a randomized controlled trial</i>	43 individuals: 21 in the usual care group and 22 in the orofacial care group	18–65 years	Both	TMD and pain	To determine whether the orofacial treatment associated with manual therapy contributes to the treatment, mainly with regard to cervical mobility.	Manual cervical therapy, regular physiotherapy, and orofacial treatment: six sessions of 30 minutes were held for both groups. Patients were instructed to perform the exercises at home. In the orofacial care group, maneuvers were carried out to eliminate tension, and regular therapy was used.	The combination of orofacial treatment and cervical therapy showed better results, with improvement of cervical mobility.
Ariji et al., 2014 ⁽²²⁾	<i>Potential clinical application of masseter and temporal muscle massage treatment using an oral rehabilitation robot in temporomandibular disorder patients with myofascial pain</i>	41 subjects received massage.	19–83 years	Both	TMD and pain	To investigate the safety and efficacy of treatment with robot massage of the masseter and temporal muscles	Therapeutic robot massage: patient in a reclined chair, pressure of 10 N on average, with a total time of 16 minutes of massage. Six sessions were held in total, every 2 weeks.	The study confirmed that massage treatment using an oral rehabilitation robot was safe. The massage treatment was effective in reducing pain in 70.3% of the patients.

Chart 3. Treatment of temporomandibular disorders—physiotherapy field (cont.)

Reference	Title	Considerations on the cases	Age	Sex	Main disorder	Study objectives	Used techniques	Result/conclusion
Ucar et al., 2014 ⁽²³⁾	<i>Effectiveness of a home exercise program in combination with ultrasound therapy for temporomandibular joint disorders</i>	18 individuals were placed in the exercise group, while 20 underwent a combination of exercises and ultrasound	29–40 years	Both	TMD and pain	To compare the effectiveness of exercise alone with that of exercise plus ultrasound for reducing pain on palpation and during oral aperture	Exercises performed twice a day for 4 weeks; the adopted exercises involved reducing muscle activity, passive mandibular movement, and isometric and counter-resistance exercises (performed for six seconds with at least repetitions). One of the groups was subjected to ultrasound five times a week for 4 weeks, with 3 minutes of implementation within the region of the TMJ and the masticatory muscles.	The combination of home exercise and ultrasound appeared to be more effective in relieving pain and increasing oral opening.
Gomes, El Hage, Amaral e Politti, 2014 ⁽²⁴⁾	<i>Effects of massage therapy and occlusal splint therapy on electromyographic activity and the intensity of signs and symptoms in individuals with temporomandibular disorder and sleep bruxism: a randomized clinical trial</i>	60 volunteers divided into four groups: massage group—15 subjects; occlusal splint group—15 subjects; group with traditional occlusal splint + massage—15 subjects; group with silicone splint—15 subjects	18–40 years	Both	TMD and pain	To investigate the effects of massage therapy, occlusal splint, and that with silicon splint on the electromyographic activity of the masseter and anterior temporal muscles in patients with TMD and bruxism.	Massage group: 30-minute massages of the masseter and temporal muscles for 12 sessions over 3 weeks; Occlusal splint group: 4 weeks of traditional occlusal splint use during the night; Massage plus occlusal splint group: combination of the treatments of the previous groups; Silicone splint group: 3-mm polyvinyl splint	Therapeutic massage and the use of occlusal splint did not significantly influence the electromyographic activity of the masseter and anterior temporal muscles when used individually. The combination of therapies led to a reduction in the intensity of signs and symptoms.
Kraaijenka et al., 2014 ⁽²⁵⁾	<i>Treatment of myogenic temporomandibular disorder: a prospective randomized clinical trial, comparing a mechanical stretching device (TheraBite®) with standard physical therapy exercise</i>	10 individuals in the experimental group and seven in the default group	17–73 years	Both	TMD and pain	To investigate whether passive movement of mandible using the TheraBite® device produces better results than traditional therapy in terms of improving TMD	Traditional therapy: guidance on mandibular operation, relaxed oral opening, tongue and cervical position, parafunctional habits, and exercises comprising masticatory muscle massage, strength and co-ordination exercises (four sessions of 30 minutes, five times a day, at home); Use of the TheraBite®: a guided oral opening session conducted for 30 seconds with five repetitions, five times a day	Both treatment modalities were equally effective in relieving the symptoms of myogenic TMD. The use of the TheraBite® device resulted in significantly greater functional improvement in the first week of treatment.

Chart 3. Treatment of temporomandibular disorders—physiotherapy field (cont.)

Reference	Title	Considerations on the cases	Age	Sex	Main disorder	Study objectives	Used techniques	Result/conclusion
Navrátil et al., 2014 ⁽²⁶⁾	<i>Comprehensive treatment of temporomandibular joint disorders</i>	24 patients undergoing TMD treatment	14–38 years	Both	TMD and pain	To evaluate the benefits of physiotherapy and to verify the reduction in temporomandibular alterations	Relaxation, mobilization, distraction, and self-mobilization exercises to improve the cognitive and motor abilities of patients; explanation of the relationship between masticatory musculature and facial movements, mandible muscle relaxation, practice of the exercises at home; Complementary methods: magnetic pulses, non-invasive laser therapy, thermotherapy, and guidance on TMDs and parafunctional habits	Long-term therapy, including physiotherapy and complementary methods, is important. As for the invasive methods, the combination of magnetic pulse with laser proved beneficial.
Godoy et al., 2015 ⁽²⁷⁾	<i>Effect of low-level laser therapy on adolescents with temporomandibular disorder: a blind randomized controlled pilot study</i>	Five individuals in the group undergoing laser therapy and four in the placebo group	14–23 years	Both	TMD and pain	To evaluate the effect of laser therapy on pain, mandibular movements, and occlusal contacts	Group subjected to laser therapy: two sessions a week for 6 weeks, with three points of application on the masseter and one on the temporal region Placebo group: the appliance was disconnected and a recording of the sounds emitted by the appliance was reproduced.	There was no difference between the treatments.
Oliveira et al., 2015 ⁽²⁸⁾	<i>Transcranial direct current stimulation and exercises for treatment of chronic temporomandibular disorders: a blind randomized-controlled trial</i>	16 individuals in the active group—transcranial stimulation and exercise 16 in the control group—exercises and placebo transcranial stimulation	18–40 years	Both	TMD and pain	To evaluate the effect of transcranial direct current stimulation (tDCS) on the exercises for TMD and chronic pain	Four weeks of exercises were undertaken for 5 consecutive days in the first week; 15 minutes followed by 20 minutes of transcranial stimulation. Subsequently, the patients performed therapeutic sessions twice a week for 3 weeks, with only exercises and stimulation. The exercises involved the cervical region, the face, the oral opening, lateral movements and protrusion of the mandible, contraction of the masseter, and manual manipulation of the neck and TMJ.	There was no difference when the tDCS was added to the therapy.
Packer et al., 2015 ⁽²⁹⁾	<i>Effect of upper thoracic manipulation on mouth opening and electromyographic activity of masticatory muscles in women with temporomandibular disorder: a randomized clinical trial</i>	16 individuals in the experimental group and 16 in the placebo group	18–40 years	Female	TMD and pain	To evaluate the effect of upper thoracic manipulation on the oral vertical opening and on the electromyographic activity of the masticatory muscles in women with TMD	Thoracic manipulation was performed at T1 and T2, with joint decompression. The patients were monitored before, as well as on the 2nd and 4th days after recovery. The placebo group received no traction manipulation.	No differences were found between treatments.

Caption: TMD = temporomandibular disorder; TMJ = temporomandibular joint

Chart 4. Treatment for temporomandibular joint disorder – Case Study

Reference	Title	Considerations on the cases	Age	Sex	Main disorder	Study objectives	Used techniques	Result/conclusion
Felício, Freitas e Bataglion, 2007 ⁽³⁰⁾	<i>The effects of orofacial myofunctional therapy combined with an occlusal splint on signs and symptoms in a man with TMD-hypermobility: case study</i>	1	49 years	Male	TMD and pain	To describe a patient with TMD and hypermobility treated with orofacial myofunctional therapy and occlusal splint.	Therapy initiated 60 days after the occlusal splint was placed. 50 minutes of therapy every 15 days, including guidelines on TMD and how to perform the exercises at home. The aim of the exercises was: to improve muscle function with training of lips and tongue mobility, and mandibular movements control improving the performance of stomatognathic system functions. The exercises employed are described in the article.	The combination of orofacial myofunctional therapy and the occlusal splint proved effective in improving the stomatognathic system and in treating TMJ hypermobility.
Monteiro et al., 2013 ⁽³¹⁾	<i>Effectiveness of global postural reeducation in the treatment of temporomandibular disorder: case report</i>	1	23 years	Male	TMD and pain	To evaluate the effectiveness of global postural re-education in the treatment of TMD	Global posture reeducation: 30-minute sessions three times a week, for eight weeks, totaling 24 sessions. Protocol explained in the article.	Improvements in the postural patterns of the cervical column helped improve the functioning of the masseter muscle, as verified by SEMG.
Yamashita et al., 2014 ⁽³²⁾	<i>Thirty-year follow-up of a TMD case treated based on the neuromuscular concept</i>	1	19 years	Female	TMD and pain	Following up a case of TMD for 30 years	Occlusal adjustment was carried out with orthopedic appliance, followed by electrostimulation (TENS). A reassessment one and two months after starting treatment. The patient was followed up for 30 years.	The occlusal adjustment performed on the patient was effective and the occlusal function was re-established. At the end of the 30-year period of follow-up, the patient did not show symptoms of TMD.
Ataç et al., 2014 ⁽³³⁾	<i>Early treatment of unilateral temporomandibular joint ankylosis: a multidisciplinary approach</i>	1	10 years	Female	TMD and pain	To investigate the effectiveness of early multidisciplinary treatment in a case of ankylosis.	Use of orthodontic appliance removed only for chewing. The patient follow-up was held for nine months. Passive exercises, which started 10 days after the surgical procedure, were carried out.	The multidisciplinary approach to the treatment of TMJ ankylosis favored the re-establishment of muscle function and promoted stability of the results during the 2-years follow-up.
Rubis et al., 2014 ⁽³⁴⁾	<i>A collaborative approach between chiropractic and dentistry to address temporomandibular dysfunction: a case report</i>	1	38 years	Female	TMD and pain	To describe the association of chiropractic and traditional therapy in patients with TMD, headache, and myalgia.	Chiropractic including cervical, thoracic, and pelvic spinal manipulation, followed by manual therapy in the face, cervical spine, and shoulder. This was combined with the use of a jaw splint during the night.	The combination of therapies led to increased oral opening, promoted pain reduction, and improved cervical range.

Caption: TMD = temporomandibular disorder; SEMG = surface electromyography; TMJ = temporomandibular joint.

only relieved pain immediately after application; no changes were observed in orofacial muscle function. In contrast, the combination of laser therapy and myofunctional therapy was more efficient than laser therapy alone, conferring results that were closer to those achieved with complete myofunctional therapy.

Among the articles in the physiotherapy field, the case-by-case characterization was not uniform among the studies, and the age of the participants ranged from 14 to 83 years. Most of the studies involved groups of less than 25 participants. Only one article⁽²⁹⁾ restricted the study subjects to women; all others included individuals of both sexes.

Regarding the tested treatments, most studies investigated the effects of manual therapy and/or massage^(21,22,24,26,29), often associated with other techniques such as the use of occlusal splints, to improve the symptoms of TMDs. As in the other fields, most of the studies verified the effects of the respective technique by comparing the pre-treatment data with the post-treatment data. Again, as noted in other fields, the long-term effects or maintenance of the obtained results were not evaluated. The most widely used assessment parameters to verify the improvement in TMD symptoms were pain on palpation or pain reported by the patients, as well as mandibular amplitude. The main objective of the studies in this area was pain reduction and improvement in mandibular mobility. There was little reference to the recovery of orofacial function, because this is not the focus of physiotherapy.

With regard to the effectiveness of the techniques used in physiotherapy, the combination of orofacial treatment and other traditional therapeutic modalities, such as manual therapy⁽²¹⁾, robot massage⁽²²⁾, ultrasound⁽²³⁾, and laser therapy⁽²⁶⁾, showed better results, contributing to reductions in orofacial pain. This corroborates the previous literature^(39,40). In addition, the use of a device that assists in the passive movement of the mandible brought functional improvement in a shorter time than conventional therapy⁽²⁵⁾. Laser therapy⁽²⁷⁾ and transcranial stimulation⁽²⁸⁾ did not show significant results when used alone.

The other analyzed articles were clinical case studies involving participants of both sexes^(30,31,32,33,34). These studies reported the effects of the following treatments on TMDs: myofunctional therapy⁽³⁰⁾, global postural re-education⁽³¹⁾, occlusal adjustment using an orthopedic apparatus combined with electrostimulation⁽³²⁾, orthodontic treatment⁽³³⁾, and chiropractic combined with traditional therapy⁽³⁴⁾. In all studies, the treatments conferred some kind of benefit to the participant, and an improvement in the signs and symptoms of TMDs were noticed.

In general, in all three fields of healthcare included in this review, we noted a lack of consensus regarding the calibration variables and the use of appliances and devices for therapy. EMG was the most common complementary evaluation method used to verify changes in muscle functioning after treatment. Furthermore, this form of assessment varied greatly among

studies in terms of the methodology applied. For example, there were differences in the number of channels used for recording the muscular response, the amplitude and frequency range of the calibration signal, and the positioning of electrodes on the facial muscles. In addition, even though the studies' main focus was improvement in the patients' quality of life, only two of the articles addressed this theme^(31,34), and only one⁽³¹⁾ used a quality-of-life protocol (WHOQOL-BREF) to check the effects of the treatment adopted.

Among the basic disorders included in the study, myofascial pain was the most prominent symptom, confirming the findings of Manfredini et al.⁽⁴¹⁾. According to these authors, muscle disorder is the most common sign in patients with TMD, followed by displacement of the articular disc and degenerative inflammatory disorders.

The credibility of the researches and the quality of the study methodologies also varied; not all of the studies used evaluation protocols that had been validated and published. Clinical trials, which used control groups, presented more detailed methodologies that would allow study replication and thus verification of the results' reproducibility. With regard to the results achieved by the treatments regardless of area, most treatments prioritized pain reduction and improvement in mandibular mobility. Few of the studies examined changes related to orofacial function. Only the speech therapy field referenced the importance of rehabilitating orofacial functions and orofacial myofunctional balance.

CONCLUSION

Despite the growing number of studies on TMD treatments, there is still no consensus regarding the best therapeutic technique and the real benefits of each one. The speech therapy field, in addition to pain reduction, emphasizes the need to rehabilitate the orofacial functions. In this way, it differs from the other treatments.

There was great diversity in the treatment protocols used, and each of them conferred some benefit. Nonetheless, protocols that combined various techniques, such as orofacial myofunctional exercises combined with laser therapy, or the use of an occlusal splint combined with orofacial myofunctional exercises, demonstrated better results than isolated treatments. Laser therapy did not confer better results than full myofunctional treatment. These combinations promoted improvements in mandibular mobility and reductions in orofacial pain. They also improved the functionality of the orofacial myofunctional system as a whole.

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