A Systematic Review and Meta-analysis of Usual Treatment Versus Psychosocial Interventions in the Treatment of Myofascial Temporomandibular Disorder Pain

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Aims: To carry out a systematic review and meta-analysis comparing the effects of occlusal splint therapy ("usual treatment") and psychosocial interventions for the treatment of myofascial temporomandibular disorder (TMD) pain in adult patients. **Methods:** Independent screening and evaluation of randomized clinical trials included comparisons between "usual treatment" based on splint therapy and psychosocial interventions for TMD treatment within electronic databases (PubMed/MEDLINE, CENTRAL, EMBASE), ongoing trials databases (Current Controlled Trials, ClinicalTrials.gov), and additional sources. The outcomes selected for the systematic review were self-reported pain, pain interference, unassisted jaw opening without pain, muscle pain upon palpation, depression, and somatization. The effect measures were analyzed using a random-effect model (Review Manager computer program). **Results:** The outcomes "long-term self-reported pain" and "long-term depression" were significantly different for the comparisons of "usual treatment" and psychosocial interventions, and they favored the latter ($P < .005$ and $P < .05$, respectively). These results must be viewed with caution due to the limited number of studies available. A tendency toward greater improvements of psychological outcomes was observed for psychosocial interventions, while physical functioning was slightly more responsive to "usual treatment." **Conclusion:** No evidence was found to distinguish the clinical effectiveness between "usual treatment" and psychosocial interventions for myofascial TMD pain. Future studies of TMD and related subdiagnoses should be reported according to core standardized outcomes to facilitate comparisons. *J Oral Facial Pain Headache 2014;28:205–222. doi: 10.11607/ofph.1241*

Key words: *meta-analysis, myofascial pain, oral myofascial pain, systematic review, temporomandibular disorders*

Temporomandibular disorders (TMD) represent a complex set of conditions reflecting different symptoms that affect the temporomandibular joint and surrounding structures. According to various literature reviews, the prevalence of TMD is approximately 10% in patients over 18 years of age,[1,2] with a considerable proportion being women of reproductive age. Symptoms fluctuate from adolescence to adulthood[3,4] and seem to remit spontaneously among the elderly.[5] Epidemiologic studies have shown that the majority of TMD patients are diagnosed with myofascial pain,[6] ie, group I of the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD).[7]

The different approaches to treatment as well as the varying types of diagnoses exemplify the lack of consensus and understanding of TMD. Unsurprisingly, the etiology of TMD remains largely controversial. Although multiple possibilities have been proposed for the treatment of TMD, most recognized standards prioritize reversible interventions over invasive ones.

This systematic review provided a meta-analysis comparing the effects of occlusal splint therapy ("usual treatment") and psychosocial interventions for the treatment of myofascial TMD pain in adult patients. Since the chronic nature of the condition involves an important psychological component, it can be hypothesized that psychosocial interventions may be more effective in the treatment of TMD in the long term.

Materials and Methods

The systematic review and meta-analysis followed the recommendations of the Cochrane Handbook for Systematic Reviews of Interventions.

Inclusion/Exclusion Criteria

Inclusion Criteria. Studies were selected according to four features: study design, patients, interventions applied, and outcomes reported.

1. *Study design:* Randomized controlled clinical trials (RCTs).
2. *Patients:* Adult patients with a diagnosis of myofascial TMD pain (with or without concomitant arthrogenous diagnoses).
3. *Intervention:* RCTs had to include a comparison between "usual treatment" based on splint therapy and any type of psychosocial intervention.
   - *"Usual treatment."* From a pragmatic standpoint, "usual treatment" was defined as the combination of therapeutic methods to treat TMD, usually splint therapy and self-care strategies[8–12] accompanied by dental professional counseling or drugs (analgesics or muscle relaxants and, occasionally, antidepressants). Counseling involves providing information about the possible etiology and pathogenesis of TMD, as well as additional advice on how to avoid behaviors that may exacerbate symptoms.[13,14] Although counseling can be regarded as a psychosocial intervention, as part of the usual treatment for TMD it represents a secondary strategy compared to splint therapy. Self-care and counseling are not well defined in the currently available literature and are often used indistinctly in the context of TMD treatment.
   - *Psychosocial interventions.* This umbrella term encompasses many different definitions. According to Ruddy and House, a psychosocial intervention is defined as any intervention that emphasizes psychological or social factors rather than biological factors.[15] In addition, van Wijk et al label under this term any intervention designed to modify specifically cognitions or emotions of a patient in a psychological sense.[16] Psychosocial interventions for TMD target psychobiological mechanisms and psychosomatic correlations in order to relieve pain and improve functionality. The core strategies for the treatment of TMD aim to enhance the coping ability of the patient and/or intensify muscular activity awareness[17] while simultaneously controlling oral parafunctions (ie, bruxism, thumb-sucking, onychophagia, and breathing disorders). Psychosocial interventions may also be present in combination with "usual treatment." For the objectives of this review, counseling and/or self-care were classified as psychosocial interventions when they were the only type of intervention.
4. *Outcomes:* Considering the RDC/TMD as a reference,[7] two outcomes for pain (self-reported pain and pain interference), two for clinical examination (unassisted jaw opening without pain and muscle pain upon palpation), and two for psychological parameters (somatization and depression) were selected. Trials were included if one or more of these outcomes were reported.

Exclusion Criteria. Trials with high risk of bias (eg, sensitivity analysis).

Search Methods for the Identification of Studies

The databases searched were MEDLINE via PubMed, 06.11.2012; The Cochrane Central Register of Controlled Trials (CENTRAL), 06.12.2012; and EMBASE, 07.11.2012.

Handsearching and Other Sources. Two RCT registration systems were consulted (Current Controlled Trials, http://www.controlled-trials.com/, on 08.11.2012, and ClinicalTrials.gov, http://www.clinicaltrials.gov/, on 29.11.2012). Additionally, abstracts from different meetings of the International Association for Dental Research (IADR) were reviewed for possible relevant trials (http://iadr.confex.com/iadr/search.epl on 29.11.2012). Likewise, the reference lists of relevant articles identified through the electronic searches were examined. Lastly, the following journals were hand searched for relevant articles: *Cranio, The Journal of Craniomandibular Practice*; *Journal of Oral Rehabilitation*; and *Deutsche Zahnärztliche Zeitschrift.*

Key Words. Databases were searched using [MeSH] terms related to myofascial pain, TMD, and craniomandibular disorders, as well as other associated terms found in the literature. Electronic searches of other resources were conducted using the terms of the condition combined with the corresponding term of each intervention.

Data Collection and Data Analysis

Data Collection Process. After an initial screening of titles and abstracts, two authors independently retrieved and evaluated every potentially relevant article. The process of screening is reported according to the QUOROM/PRISMA (Quality of Reporting of Meta-analysis/Preferred Reporting Items for Systematic Reviews and Meta-Analyses) criteria.[18] General data and outcome results were also extracted from the full text of the eligible articles. These data were compiled in predesigned forms. Partial results were shared and discussed with a third reviewer. Corresponding authors were

contacted via email when additional information on incomplete data was needed.

Quality Evaluation of the RCTs. All the included studies were evaluated in accordance with the Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 (updated March 2011).[19] The risk of bias of the included studies (full-text version) was assessed independently by two reviewers using the corresponding Cochrane Collaboration's tool. In case of discrepancies, data were reviewed concurrently by both reviewers and, if needed, a third reviewer was used as arbiter.

Units of Analysis. The "usual treatment" intervention can be differentiated into two experimental designs: patient-specific (tailored intervention) or group-wide application. These two modalities are implemented according to the personal beliefs of the treating clinicians, ie, the decision to adopt a tailored intervention will depend on the specific needs of the TMD patient. Due to imbalances in the tailored interventions, these studies must be distinguished from "usual treatment" when applied homogenously for all patients. However, the definition of "usual treatment" involves the same therapeutic components.

Assessment of Heterogeneity. The statistical heterogeneity was verified using the chi-square test at significance of 0.1. The I^2 statistic allowed the quantification of inconsistency across studies according to the Cochrane Collaboration instructions as unimportant (0% to 40%), moderate (30% to 60%), substantial (50% to 90%), and considerable (75% to 100%).[19] Clinical and methodological heterogeneity was discussed based on study design (patients, settings, and interventions) and the tool for assessing risk of bias.[20]

Sensitivity Analysis. The exclusion criterion for this review was trials with a high risk of bias. Since blinding of participants and personnel are technically difficult to implement, blinding of outcome assessment was considered the critical parameter for comparing the interventions. A trial was considered to have a high risk of bias when blinding of outcome assessment, or two or more other domains, were judged as high risk of bias. The same criteria were applied to classify trials as unclear risk of bias.

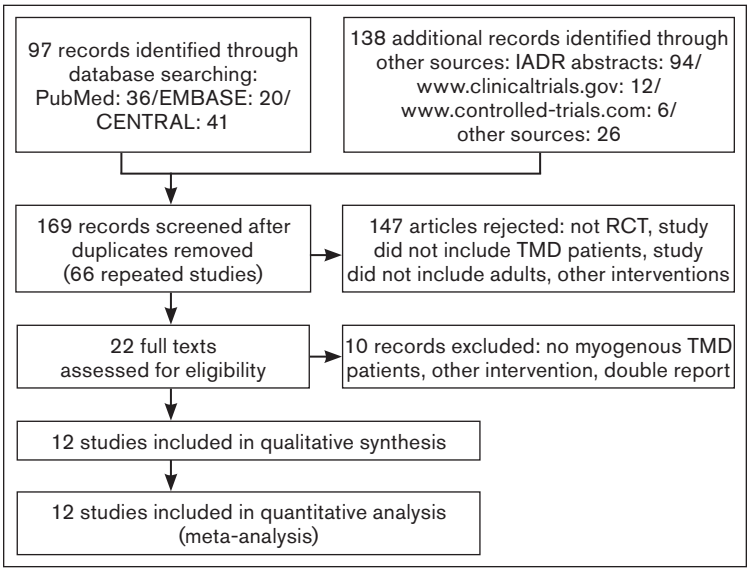


Fig 1 Study flow diagram.

Studies that could possibly be classified as outliers were subject to sensitivity analysis in order to evaluate their overall effect on the results of the meta-analysis.

Effect Measures. Continuous data were summarized with standardized mean differences or mean differences by using a random-effect model. Additionally, reviewers performed a publication bias analysis for every outcome by using funnel plots. Data were analyzed using Review Manager (RevMan computer program Version 5.2).

This report follows the PRISMA guidelines.[18]

Results

A total of 169 different titles of potentially relevant clinical trials were identified (Fig 1). Of these, 135 articles were excluded because they were not RCTs or because they did not match the intervention or condition of TMD. Additionally, 12 did not enroll adults or myogenous TMD patients. The remaining 22 articles were independently assessed by two reviewers.

Two studies were labeled "awaiting for classification" and their corresponding authors were contacted. One study was reported in two different abstracts at the same IADR meeting.[21,22] However, it was not possible to conclude that "usual treatment" had been employed, and therefore the data of this study was not included in the analysis. The other RCT[23] currently only has information on subsamples.

After a second screening, 10 RCTs were excluded for the following reasons: did not fulfill the definition of the condition,[24–27] was a repeated study,[28] and did not match the definition of "usual treatment."[29–32] Thus, 12 trials (n = 1,132) were considered relevant to the meta-analysis. Among those included, 75% used the RDC/TMD as a diagnostic tool. When available, results were classified as short term (3 months or less) or long term (more than 3 months).

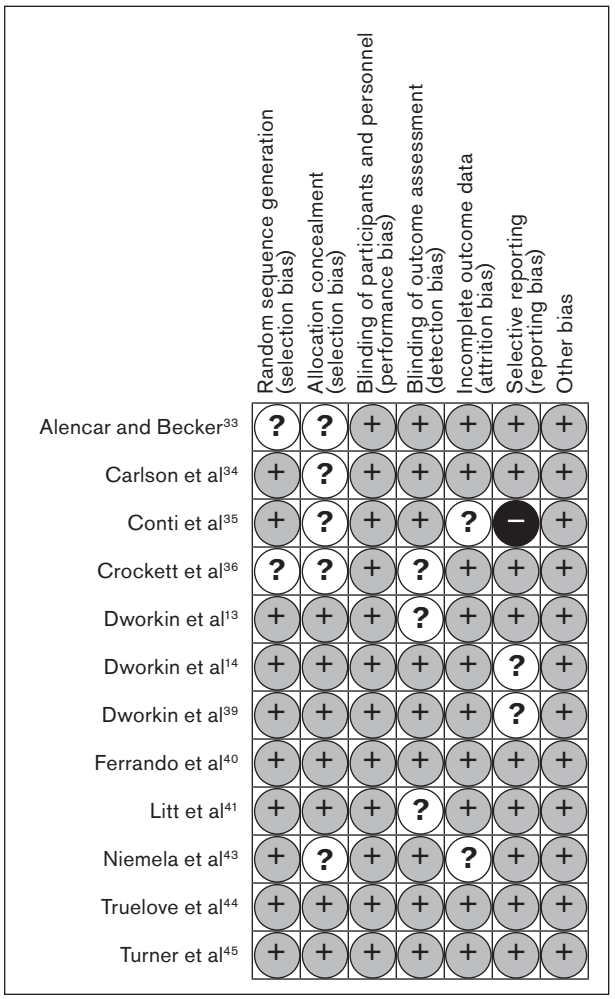


Fig 2 Risk of bias summary according to the Cochrane's risk of bias tool.

Description of the Included Studies

Table 1 presents the details of the studies included in this review. Of the 12 included studies (n = 1,132 participants), 7 (n = 535 participants)[33–36,41,43,44] applied predefined "usual treatment" for all patients in the intervention group. These studies applied, therefore, balanced interventions. In contrast, the other 5 studies (n = 597 participants)[13,14,39,40,45] used a tailored version, in which the attending dentist independently decided the treatment for each patient, choosing among the therapeutic methods considered to be part of the "usual treatment." In this group of studies, dental treatment was not monitored.

The definition of "usual treatment" matched the groups with different combinations. "Usual treatment" for all these studies reported the prescription of a hard stabilization splint (except for Turner et al,[45] in which details of the dental treatment were not assessed). Recommendations on how to wear the splint varied from only nocturnal[34,35]; nocturnal wearing plus 2 hours while awake[44]; and full-time except for eating during the first 1 to 4 weeks, followed by only nocturnal wearing.[33,41] Two articles did not specify wearing time.[36,43] The studies that included tailored interventions did not define the time of splint use in concordance with the group definition.[13,14,39,40,45]

Psychosocial interventions were basically divided into two categories: *(1)* psychosocial interventions only and *(2)* a combination of psychosocial interventions plus "usual treatment." Interventions within the first category were counseling and self-care only,[35,39,43,44] counseling and self-care with a placebo splint[33] or physical self-regulation,[34] and electromyographic (EMG) biofeedback plus self-care strategies.[35] The second category consisted of cognitive behavioral therapy (CBT) plus "usual treatment."[13,40,41,45]

Only studies with at least 75% of patients diagnosed with myofascial pan at baseline were included: 100% in seven studies[33–36,39,40,44] and different percentages in four studies (96.0%[45]; 94.8%[14]; 90.1%[43]; 77%[41]). TMD clinical diagnoses were not considered in one study.[13] However, the relatively large sample in this RCT allows the assumption of findings similar to general epidemiologic data.

Risk of Bias in Included Studies

All authors of the included studies were contacted. This substantially improved the general and particular assessment of risk of bias in the included RCTs. Four studies were evaluated as having unclear risk of bias[13,35,36,41] (Fig 2); the other eight had low risk of bias.

The authors considered the item blinding patients and personnel was irrelevant for these sorts of comparisons because of the difficulty in implementing blinding during the treatment. Consequently, blinding of the outcome assessment (according to the definition of the Cochrane Collaboration) was considered especially important for the meta-analysis.[19] Three RCTs did not expressly report a method for blinding the outcome assessor and included two that provided insufficient information. In the study by Litt et al,[41] long- but not short-term outcomes were assessed through interviews conducted in person. Nonetheless, the lack of details prevented a thorough assessment of the effect of the methodology, since the data in the long term were consistent with the results in the short term.

Additionally, a sensitivity analysis was conducted. The outcomes in comparison 1 ("usual treatment" vs psychosocial intervention) exhibited high robustness, except for long-term muscle pain, which was included in only one study.[44] Likewise, outcomes in comparison 2 ("usual treatment" vs psychosocial intervention + "usual treatment") displayed high robustness, except for short-term self-reported pain (which was highly influenced by one study[40]) and long-term somatization determined by Dworkin et al.[39]

Considering the low number of included studies, reviewers performed a publication bias analysis only for short-term self-reported pain. The funnel plot for comparison 1 presented a symmetric distribution, which was interpreted as low risk of publication bias. The funnel plot for comparison 2 did not show conclusive results (funnel plots not published).

Effects of Interventions

The reviewers conducted two different comparisons according to the type of intervention. Comparison 1 ("usual treatment" vs psychosocial intervention) included all the studies with balanced interventions, ie, those that treated patients equally. Comparison 2 ("usual treatment" vs psychosocial intervention + "usual treatment") incorporated studies reporting the tailored version of "usual treatment," ie, following the decision of the attending dentist for each patient.

Comparison 1. "Usual Treatment" vs Psychosocial Intervention. This comparison included two subgroups:

1. "Usual treatment" vs psychosocial intervention only[33–36,43,44]
2. "Usual treatment" vs psychosocial intervention plus "usual treatment"[41]

Primary Outcomes: Self-reported pain intensity and unassisted jaw opening without pain (mm).

- *Self-reported pain at short term (less than 3 months):* Short-term pain intensity was reported in all six studies of subgroup 1 using a predefined "usual treatment" showing moderate heterogeneity (Table 2). Additionally, one RCT using a combination of psychosocial intervention plus "usual treatment" (subgroup 2) reported this outcome. Although some pain measurements included frequency and duration, overall heterogeneity for this outcome was negligible (I^2 = 36%; P = .15), without any differences observed among subgroups (I^2 = 0%; P = .54). There were no statistically significant differences between "usual treatment" and psychosocial interventions (P = .57) in comparison 1. Better results were observed for "usual treatment" when comparing only reports of actual pain intensity on a visual analog scale (VAS).[35,36,43] For studies using an average of the actual, worst, and usual pain,[34,41,44] the results showed better improvements with psychosocial interventions. Nevertheless, the difference between interventions was also not statistically significant.
- *Self-reported pain at long term (more than 3 months):* Three studies reporting averages of actual, worst, and usual pain exhibited no significant differences in the overall effect of the interventions (P = .35), although there was substantial heterogeneity (I^2 = 65%, P = .06; Table 3). Heterogeneity decreased to I^2 = 0% (P = .91) when only the studies measuring self-reported pain at long term with the Multidimensional Pain Inventory (MPI) were considered.[34,41] By analyzing these two studies separately, the results were statistically significant for the overall effect (P = .02) with a mean difference (MD) of 1.03 (confidence interval [CI] 0.2, 1.86), showing greater long-term efficacy of the psychosocial interventions.
- *Unassisted jaw opening without pain at short term and long term:* Three studies provided complete data for this outcome at short term[34,36,43] (I^2 = 43%, P = .17; Table 4). Only one trial[34] reported this outcome at long term. "Usual treatment" was more effective in increasing jaw opening, although the results did not exhibit meaningful significance (P = .41).

Secondary Outcomes: Pain interference, muscle pain upon palpation, somatization, and depression.

- *Pain interference at short term (less than 3 months) and at long term (more than 3 months):* Two studies[33,40] (I^2 = 0%, P = .63) reported more benefits at short term for interventions including psychosocial interventions. Differences between groups, however, were not significant. The same RCTs provided data for this outcome in the long term (I^2 = 0%, P = 1.00). The results were once again not significant.
- *Muscle pain upon palpation at short term and long term:* Four studies[33,34,43,44] using different scales reported muscle pain upon palpation at short term, but without presenting heterogeneity (I^2 = 0%, P = .66). The results suggested a greater effect for psychosocial interventions (Table 5), but significantly greater (P = .08). This tendency did not persist in the long term.
- *Somatization and depression at short and long term:* Only one RCT[34] provided data for somatization, and the results favored psychosocial interventions (P = .09). No changes were observed in the long term (overall effect P = .11). Two RCTs[34,41] (I^2 = 0%, P = .52) reported intervention effects on depression but without significant differences either at short term (P = .27) or long term (P = .75).

Comparison 2. Tailored "Usual Treatment" vs Psychosocial Interventions. This comparison included two subgroups:

1. Tailored "usual treatment" vs psychosocial intervention only[39]
2. Tailored "usual treatment" vs psychosocial intervention plus tailored "usual treatment"[13,14,40,45]

Table 1 Included Studies

Author	Study design	Patient group	Intervention details
Alencar and Becker[33]	Single-center RCT, three parallel groups; follow-up for 90 d	42 patients with myofascial pain (American Academy of Orofacial Pain): mean age 34 (range 18–65) y, 88.10% women Location: Brazil	1. Mandibular hard occlusal splint 2. Mandibular soft occlusal splint 3. Non-occluding splint Indications for all groups: full-time wearing of the respective splint during the first week; after this period, only nocturnal wearing Cointerventions: education, counseling, and self-care instructions for all groups
Carlson et al[34]	Single-center RCT, two parallel groups; follow-up for 26 wk	44 participants with myofascial pain (group Ia and group Ib RDC/TMD): mean age analyzed sample 34.6 y; 77.27% women; average pain duration 52.3 mo Location: USA	1. Standard dental care (stabilization splint, nocturnal wearing + self-care strategies [eg, soft diet, jaw relaxing]) 2. Physical self-regulation: two 50-min sessions (strategies for seven domains: monitoring and reducing muscle parafunction in the head and neck region, proprioceptive awareness training to improve symmetric head and neck posture, instructions for improving sleep onset, position-oriented relaxation training, physical activity, nutrition/fluid management, and diaphragmatic breathing training)
Conti et al[35]	Single-center RCT, three parallel groups; follow-up for 3 mo	51 participants with myofascial pain with or without opening limitation (RDC/TMD): mean age 37.16 y; 88.23% women Location: Brazil	1. Stabilization appliance (nocturnal wearing only) + self-care strategies (relaxation techniques, diet modification, thermotherapy, massage in the painful area) and counseling (habits and behavioral changes + education) 2. NTI appliance + counseling and self-care strategies + education 3. Counseling and self-care strategies only
Crockett et al[36]	Single-center RCT, three parallel groups; post-treatment evaluation	21 participants with chronic pain complaint, tenderness to palpation of masticatory muscles; limitation or deviation of jaw mobility; and absence of radiographic evidence of joint pathology: 100% women Location: Canada	1. Dental program (occlusal splint + weekly physiotherapy sessions with hot/cold applications, also postural corrections and jaw exercises + recommendations (avoidance of chewy foods) 2. Biofeedback-enhanced progressive relaxation program (progressive muscle relaxation training program + EMG biofeedback + home-practice exercises) 3. Transcutaneous Electrical Nerve Stimulation (TENS) (weekly 30-min sessions)
Dworkin et al[13] Additional reports: Turner et al[36] described predictors in a stepwise regression, and Whitney and Dworkin[38] analyzed the randomization strategy.	Multicenter RCT, two parallel groups; follow-up for 12 mo	139 participants with TMD: mean age 37 ± 10.3 y; 85% women; 96% Caucasian; 81% completed more than high school education Location: USA	1. CBT: two sessions in small group format (education, biobehavioral management of TMD, self-monitor TMD signs and symptoms, stress coping, introduction to CBT, progressive relaxation method, jaw muscles) preceding usual treatment 2. Usual treatment (conservative treatment, splint, NSAIDs, passive and active jaw motion exercises, modification of parafunctional and/or dietary habits, and regular use of cold and heat packs)
Dworkin et al[14]	Single-center RCT, two parallel groups; treatment for 4 mo, follow-up for 12 mo	117 patients with orofacial pain and RDC/TMD Axis II GCP score of II High, III, or IV: mean age 38.8 (SD = 10) y; 82.91% women; education level higher than high school 72.65% Location: USA	1. Comprehensive care ("usual treatment" + CBT and methods employed in multidisciplinary management of chronic pain including exercises for jaw stretching and jaw muscle relaxation) 2. Usual treatment (at the discretion of the attending dentist: intraoral occlusal appliance + physiotherapy + medication + patient education including self-care behaviors)

Outcome variables	Key findings
Muscle Pain Index (6 sites scored 0–3) Subjective pain using the Mod-SSI	The three intervention groups showed similar significant reduction of subjective pain (Mod-SSI) at 90 d follow-up. Tenderness upon palpation was equally reduced; however, this effect was detected first in the group 1 ("usual treatment"). The group receiving non-occluding splint was considered a psychosocial intervention in our review, due to the splint functioning only as a reminder.
Life interference (MPI) Pain severity (MPI) Pain intensity (VAS) Ability to control pain Somatization (SCL-90-R) Depression (SCL-90-R) Anxiety (SCL-90-R) Affective distress (SCL-90-R) Unassisted jaw opening without pain (mm) Unassisted jaw opening with pain (mm) Muscle Pain Index (17 sites) Sleep quality (Pittsburgh) Awareness of tooth contact (min) Obsessive/compulsive (SCL-90-R) Fatigue (0–10)	Both groups exhibited significant improvements in all outcomes posttreatment except for depression, anxiety, and fatigue with no significant differences during the assessment period. At 26 wk follow-up, however, group 2 (psychosocial intervention) reported significantly less pain, and greater jaw opening with and without pain, than group 1 ("usual treatment").
Pain intensity (VAS) Pressure Pain Threshold Number of occlusal contacts	All groups reduced pain significantly without showing differences between groups; however, group 1 ("usual treatment") showed effects earlier. No significant differences were found for the other outcomes (no. of occlusal contacts was not fully reported).
Pain to palpation (0–4) Worst pain (0–4) Subjective pain (MPQ) Weekly pain intensity (average daily pain over 3 wk) Frequency of pain EMG Treatment expectancy Perception of therapist qualities Interincisal opening (mm)	Pain upon palpation decreased for all the groups, without differences between groups. Groups 1 ("usual treatment") and 2 (psychosocial intervention) reported lower pain frequency than group 3; however, group 2 presented lower frequency of pain at baseline. Group 1 was significantly more effective in pain relief (worst pain and weekly frequency of pain) compared to group 3. Group 2 showed significantly lower weekly pain intensity than group 3. No EMG differences between groups were detected.
CPI GCPS Pain interference score (0–10) Somatization (SCL-90-R) Depression (SCL-90-R) Helpfulness of treatment (0–10) Unassisted jaw opening without pain (mm) Maximum assisted opening (mm)	Similar improvements were found in both groups for all outcomes; however, the effects of the pychosocial intervention (group 1) were more persistent in time for CPI and pain interference. CPI and somatization, but not unassisted jaw opening, differentiated functional from dysfunctional patients. From pretreatment to 3-mo follow-up, ability to control pain and passive coping were associated with pain relief, jaw opening, and depression; they also predicted greater activity interference at 12-mo follow-up (Turner et al[36]).
CPI Pain interference score (0–10) Ability to control pain (0–6) Somatization (SCL-90-R) Depression (SCL-90-R) Helpfulness of treatment Satisfaction with treatment Unassisted jaw opening without pain (mm) Unassisted jaw opening with pain (mm) Maximum assisted opening (mm) Number of muscle sites tender to palpation (16 extraoral + 4 intraoral sites)	Group 1 (psychosocial intervention) showed a greater reduction of CPI and increase of ability to control pain posttreatment compared to group 2 ("usual treatment"). At 1-y follow-up, both groups exhibited similar improvements for those outcomes and for pain interference. Neither unassisted jaw opening nor muscle pain upon palpation varied significantly for any group during the study.

Table 1 Included Studies *(continued)*

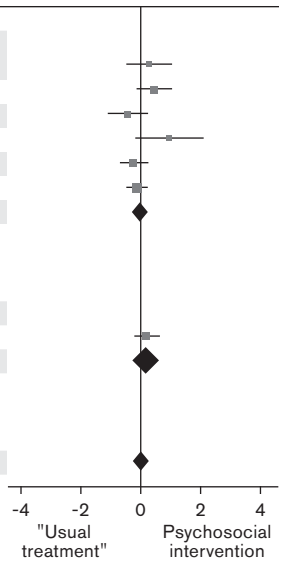
Author	Study design	Patient group	Intervention details
Dworkin et al[39]	Single-center RCT, two parallel groups; treatment for 2.5 mo, follow-up for 12 mo	124 patients with orofacial pain and RDC/TMD Axis II GCP score of 0, I, or II-Low: mean age 37.5 (SE =1.09) y; 84.68% women; education level higher than high school group A = 91.8%, education level higher than high school group B = 66.7% (groups differed significantly) Location: USA	1. Self-care intervention (manual-based individual three sessions of self-care including cognitive-behavioral methods) 2. "Usual treatment" (at discretion of the attending dentist: physiotherapy, medications, occlusal appliance, and patient education including a printed version of the instructions for the self-care strategies)
Ferrando et al[40]	Single-center RCT, two parallel groups; follow-up for 3 mo Note: Posttreatment evaluation was 3 mo after treatment and follow-up evaluation 9 mo after posttreatment only in the experimental group	59 participants with myofascial pain (RDC/TMD): mean age 38.98 y; 88.14% women Location: Spain	1. CBT for chronic pain syndromes: six 1-h sessions (psychoeducation, distraction, imagination techniques, assertiveness training, cognitive restructuring, activity planning, functional analysis of pain and modification to the contingencies, and hypnosis techniques) over 2.5 mo + standard conservative therapy 2. Standard conservative therapy (splint, jaw exercises, NSAIDs, and/or muscle relaxants); this intervention was neither uniform nor monitored, although patients were asked for accomplishment (50% experimental group, and 49% control group)
Litt et al[41] Additional report: Litt et al[42] refers to a subset of the sample	Single-center RCT, two parallel groups; 6 wk treatment, follow-up for 12 mo	101 patients with TMD (RDC/TMD): mean age 39.4 (SD = 12.1) y; 84.16% women; years of education = 14.7 (SD = 2.5); 79% Caucasian, 9% African-American, 9% Hispanic, 3% self-described as other; average duration of pain 6.7 y (SD = 6.6); mean pain intensity 3.5 on a scale to 6 (SD = 1.3) Location: USA	1. Standard treatment (splint 4 wk continuously and later only a night guard + soft diet + naproxen sodium 550 mg BID during 5 wk; alternatively extra-strength acetaminophen in case of gastric ulcer disease) 2. Standard treatment + CBT (rationale for treatment + relaxation training and self-efficacy enhancement + masseter EMG biofeedback-assisted relaxation + habit modification + combating negative thoughts and catastrophization + stress management)
Niemela et al[43]	Single center RCT, two parallel groups; follow-up for 1 mo	76 participants with TMD (RDC/TMD): mean age 43.65 y; 77.5% women	1. Stabilization splint, counseling, and masticatory muscle exercises 2. Counseling and instructions for masticatory muscle exercises
Truelove et al[44]	Single-center RCT, three parallel groups; follow-up for 12 mo	200 patients with myofascial pain (Group Ia or Ib), with or without other concurrent diagnoses, with minimal pain interference: mean age = 35.67 y; 86% women; 75.5% education more than high school; 8.5% race nonwhite; mean number of years with facial pain = 5.33; income $50,000 or greater 34.67% Location: USA	1. Self-care strategies only (jaw relaxation, reduction of parafunction, thermal packs, NSAIDs, passive opening stretches, and suggestions about stress reduction) 2. Self-care strategies + hard splint in centric occlusion nocturnal wearing and additional 2 h daily while awake throughout the 3-mo and 12-mo follow-up 3. Self-care strategies + soft splint in centric occlusion, nocturnal wearing and additional 2 h daily while awake throughout the 3-mo and 12-mo follow-up
Turner et al[45] Additional reports: subsamples in the articles by Wig et al,[46] Turner et al,[47] Aaron et al[48]; combined a sample from this study and other samples in the article by Turner et al[49] and Turner et al[50]	Single-center RCT, two parallel groups; follow-up for 12 mo	158 patients with TMD (RDC/TMD): mean age original sample 37.0 (± 11.4) years; 86.49% women; 21.62% high school or less, 41.22% some college or vocational/technical, 37.16% college graduate Location: USA	1. Pain management training (standard CBT for pain and chronic TMD pain, including breathing, relaxation, fear-avoidance, and relapse prevention techniques) + "usual treatment" according to dentist prescription (intraoral occlusal appliance + jaw stretching exercises + patient education + medication) 2. Self-care management ("usual treatment" according to dentist prescription, TMD education and general health education, excluding CBT)

CBT = cognitive behavioral therapy; NSAIDs = nonsteroidal anti-inflammatory drugs; TMD = temporomandibular disorders; Mod-SSI = Modified Symptom Severity Index; MPI = Multidimensional Pain Inventory; VAS = visual analog scale; SCL-90-R = Symptom Checklist-90-Revised; MPQ = McGill Pain Questionnaire; EMG = electromyography; Graded Chronic Pain Scale = GCPS; BS-18 = Brief Symptoms Inventory-18; CPI = characteristic pain intensity; PRSS = Pain Related Self-Statements; MBSS = Miller Behavioral Style Scale; PSCQ = Pain Stages of Change Questionnaire; CPSS = Chronic Pain Self-Efficacy Scale; MFIQ = Mandibular Function Impairment Questionnaire; PCS = Pain Catastrophizing Scale; CESD = Center for Epidemiologic Studies Depression Scale; CSQ = Coping Strategies Questionnaire.

Outcome variables	Key findings
CPI GCPS Somatization (SCL-90-R) Depression (SCL-90-R) Helpfulness of treatment (0–10) Satisfaction with treatment (0–5) Unassisted jaw opening without pain (mm) Unassisted jaw opening with pain (mm) Maximum assisted opening (mm) Number of muscle sites tender to palpation (0–16) Increase of knowledge (0–10)	Both interventions improved the clinical condition of the patients. At 12-mo follow-up, the adjusted outcomes CPI, pain interference, and number of extraoral masticatory muscles painful upon palpation were significantly lower for group 1 (psychosocial intervention) compared with group 2 ("usual treatment"). Moreover, the patients of group 1 reported more treatment satisfaction and helpfulness than group 2. No differences between groups were detected for the other outcomes.
Pain intensity (GCPS; confirmed by author) Pain interference (MPI) Pain severity (MPI) Somatization (BS-18) Depression (BS-18) Anxiety (BS-18) Number of muscle sites tender to palpation (16 extraoral + 4 intraoral sites) Pain frequency (no. of days) Self-medication frequency (no. of days) Subjective pain (MPQ) Emotional distress (BS-18)	At 3-mo follow-up, the intervention 1 (psychosocial intervention) was significantly more effective than intervention 2 ("usual treatment") for pain intensity, pain frequency, subjective pain, pain severity, self-medication frequency, emotional distress (anxiety and somatization). No comparisons were performed at 9-mo follow-up.
Pain interference score (MPI) Pain severity (MPI) Coping (PRSS, MBSS) Somatization (SCL-90-R) Depression (CESD depression score) Catastrophizing (PRSS) Readiness (PSCQ) Self efficacy (CPSS)	Both interventions produced clinical improvements (depression and interference); however, group 2 (psychosocial intervention) exhibited significantly greater decreases in pain reports and catastrophizing at 52-wk follow-up. Readiness, somatization, and self-efficacy were moderators of the treatment. Coping, catastrophizing, somatization, self-efficacy, and optimism were predictors of depression. Likewise, all these variables except for coping were predictors of interference. Only somatization moderated the effect of treatment on interference.
Pain intensity (VAS) Unassisted jaw opening without pain (mm) Number of muscle sites tender to palpation (20) TMJ pain (%) Laterotrusion and protrusion (mm)	No significant differences between groups were found.
CPI Unassisted jaw opening without pain (mm) Maximum assisted opening (mm) Number of muscle sites tender to palpation (16 + 4) TMJ pain (0–4) Pain frequency (h) Pain/limitations during chewing (%) TMJ sounds/locking (%) Tinnitus (%) Jaw clenching (%)	No significant differences between groups were observed. Note: The authors defined the intervention of self-care strategies as "usual treatment." To avoid confusion with the term used in this review, the review authors named this intervention "self-care strategies."
GCPS CPI Activity interference MFIQ (17-item) 21-Item Beck Depression Inventory (BDI) Survey of Pain Attitudes: disability, harm, and control TMD Self-Efficacy Scale (8-item) CSQ catastrophizing scale, and four-item rumination subscale of the PCS Four scales from the Chronic Pain Coping Inventory: rest, task persistence, coping self-statements, and relaxation Treatment credibility adapted to TMD treatment TMD knowledge Treatment helpfulness and credibility	Group 1 (psychosocial intervention) exhibited significantly greater improvements than group 2 ("usual treatment") in all adjusted outcomes except for three of the coping scales (task persistence, self-statements, and rest), MFIQ, and TMD knowledge. The odds of reporting no activity interference and having a BDI score < 21 at 12 mo after adjusting for baseline interference were four times greater in group 1 than in group 2.

Table 2 Forest Plot Comparison 1: "Usual Treatment" vs Psychosocial Interventions. Self-Reported Pain at Short Term

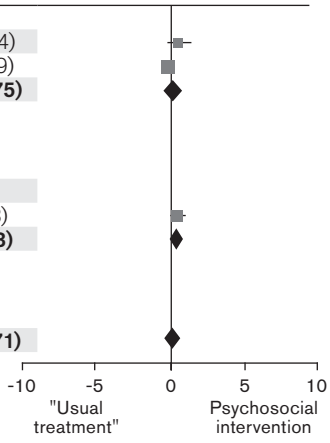
Study or subgroup	"Usual treatment" Mean	SD	Total	Psychosocial intervention Mean	SD	Total	Weight	Standard mean difference IV, Random (95% CI)
"Usual Treatment" vs Psychosocial Intervention								
Alencar and Becker[33] *(1)*	0.31	0.2	14	0.24	0.24	14	9.3%	0.31 (-0.44, 1.05)
Carlson et al[34] *(2)*	2.4	1.9	21	1.6	1.3	23	12.8%	0.49 (-0.11, 1.09)
Conti et al[35] *(3)*	13.9	22.9	21	24.5	29.2	14	10.7%	-0.41 (-1.09, 0.28)
Crockett et al[36] *(4)*	29	8.9	7	18.6	10.6	7	4.6%	0.99 (-0.14, 2.13)
Niemela et al[44] *(5)*	34	32	39	40	26	37	18.4%	-0.20 (-0.65, 0.25)
Truelove et al[45] *(6)*	4.4	2	68	4.6	2	64	24.2%	-0.10 (-0.44, 0.24)
Subtotal (95% CI)			**170**			**159**	**80.1%**	**0.05 (-0.26, 0.36)**
Heterogeneity: Tau² = 0.06; Chi² = 8.58, *df* = 5 (*P* = .13); I² = 42%								
Test for overall effect: Z = 0.33 (*P* = .74)								
"Usual Treatment" vs Psychosocial Intervention + "Usual Treatment"								
Litt et al[41] *(7)*	2.04	3.06	40	1.38	2.99	49	19.9%	0.22 (-0.20, 0.64)
Subtotal (95% CI)			**40**			**49**	**19.9%**	**0.22 (-0.20, 0.64)**
Heterogeneity: Not applicable								
Test for overall effect: Z = 1.01 (*P* = .31)								
Total (95% CI)			**170**			**159**	**80.1%**	**0.08 (-0.18, 0.33)**
Heterogeneity: Tau² = 0.04; Chi² = 9.40, *df* = 6 (*P* = .15); I² = 36%								
Test for overall effect: Z = 0.57 (*P* = .57)								
Test for subgroup differences: Chi² = 0.38, *df* = 1 (*P* = .54); I² = 0%								



(1) Mod-SSI
(2) MPI pain severity (0–6)
(3) VAS
(4) Average over 3 weeks of weekly reports of pain intensity (0–4)
(5) VAS
(6) CPI
(7) MPI pain severity (0–6)

Table 3 Forest Plot Comparison 1: "Usual Treatment" vs Psychosocial Interventions. Self-Reported Pain at Long Term

Study or subgroup	"Usual treatment" Mean	SD	Total	Psychosocial intervention Mean	SD	Total	Weight	Standard mean difference IV, Random (95% CI)
"Usual Treatment" vs Psychosocial Intervention								
Carlson et al[34] *(1)*	2	1.5	13	1.2	1.5	19	23.9%	0.52 (-0.20, 1.24)
Truelove et al[44] *(2)*	3	2	68	3.3	2	64	41.4%	-0.15 (-0.49, 0.19)
Subtotal (95% CI)			**81**			**83**	**65.0%**	**0.11 (-0.53, 0.75)**
Heterogeneity: Tau² = 0.14; Chi² = 2.72, *df* = 1 (*P* = .10); I² = 63%								
Test for overall effect: Z = 0.33 (*P* = .74)								
"Usual Treatment" vs Psychosocial Intervention + "Usual Treatment"								
Litt et al[41] *(3)*	2.64	2.97	36	1.23	2.95	38	35.0%	0.47 (0.01, 0.93)
Subtotal (95% CI)			**36**			**38**	**35.0%**	**0.47 (0.01, 0.93)**
Heterogeneity: Not applicable								
Test for overall effect: Z = 2.00 (*P* = .05)								
Total (95% CI)			**117**			**121**	**100.0%**	**0.23 (-0.25, 0.71)**
Heterogeneity: Tau² = 0.11; Chi² = 5.79, *df* = 2 (*P* = .06); I² = 65%								
Test for overall effect: Z = 0.94 (*P* = .35)								
Test for subgroup differences: Chi² = 0.82, *df* = 1 (*P* = .37); I² = 0%								



(1) MPI pain severity (0–6)
(2) CPI
(3) MPI pain severity (0–6)

Primary Outcomes: Self-reported pain intensity.

- *Self-reported pain at short term (less than 3 months):* Five studies provided data for pain intensity at short term. One study could not be pooled due to incomplete data.[14] The four remaining studies[13,39,40,45] showed substantial heterogeneity (I^2 = 60%, *P* = .06) with a non-significant overall effect (*P* = .62) (Table 6).

Table 4 Forest Plot Comparison 1: "Usual Treatment" vs Psychosocial Interventions. Unassisted Jaw Opening Without Pain at Short Term

Study or subgroup	"Usual treatment" Mean	SD	Total	Psychosocial intervention Mean	SD	Total	Weight	Standard mean difference IV, Random (95% CI)
"Usual Treatment" vs Psychosocial Intervention								
Carlson et al[34]	36.2	8.6	21	41.6	8.3	23	34.2%	-5.40 (-0.11, 1.09)
Crockett et al[36]	43	7.23	7	40.7	7.11	7	20.2%	2.30 (-0.14, 2.13)
Niemela et al[43]	45.9	8.7	39	46.5	7.8	37	45.5%	-0.60 (-0.65, 0.25)
Truelove et al[44]	40	0	68	40.8	0	64		Not estimable
Subtotal (95% CI)			**135**			**131**	**100%**	**1.66 (-5.60, 2.28)**
Heterogeneity: $Tau^2 = 5.29$; $Chi^2 = 3.53$, $df = 2$ ($P = .17$); $I^2 = 43\%$								
Test for overall effect: Z = 0.82 ($P = .41$)								
Total (95% CI)			**135**			**131**	**100%**	**1.66 (-5.60, 2.28)**
Heterogeneity: $Tau^2 = 5.29$; $Chi^2 = 3.53$, $df = 2$ ($P = .17$); $I^2 = 43\%$								
Test for overall effect: Z = 0.82 ($P = .41$)								
Test for subgroup differences: Not applicable								

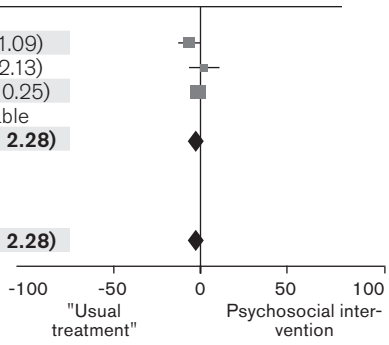
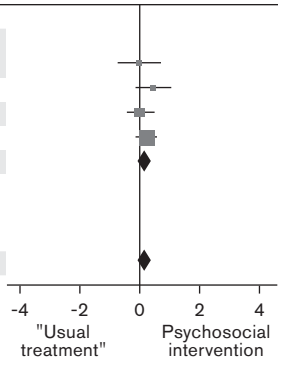


Table 5 Forest Plot Comparison 1: "Usual Treatment" vs Psychosocial Interventions. Muscle Pain at Short Term

Study or subgroup	"Usual treatment" Mean	SD	Total	Psychosocial intervention Mean	SD	Total	Weight	Standard mean difference IV, Random (95% CI)
"Usual Treatment" vs Psychosocial Intervention								
Alencar and Becker[33] *(1)*	0.3	0.5	14	0.3	0.7	14	10.1%	0.00 (-0.74, 0.74)
Carlson et al[34] *(2)*	19.3	22.4	21	11.2	12.1	23	15.4%	0.45 (-0.15, 1.05)
Niemela et al[43] *(3)*	9.5	4.6	39	9.3	5.3	37	27.4%	0.04 (-0.41, 0.49)
Truelove et al[44] *(4)*	5.6	5.4	68	4.3	4	64	47.1%	0.27 (-0.07, 0.61)
Subtotal (95% CI)			**142**			**138**	**100%**	**0.21 (-0.03, 0.44)**
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 1.58$, $df = 3$ ($P = .66$); $I^2 = 0\%$								
Test for overall effect: Z = 1.73 ($P = .08$)								
Total (95% CI)			**142**			**138**	**100%**	**0.21 (-0.03, 0.44)**
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 1.58$, $df = 3$ ($P = .66$); $I^2 = 0\%$								
Test for overall effect: Z = 1.73 ($P = .08$)								
Test for subgroup differences: Not applicable								

(1) 6 muscle sites (0–3)
(2) 17 muscle sites scored 0–3
(3) According to RDC/TMD
(4) Mean extraoral muscle sites tender to palpation (out of 16)



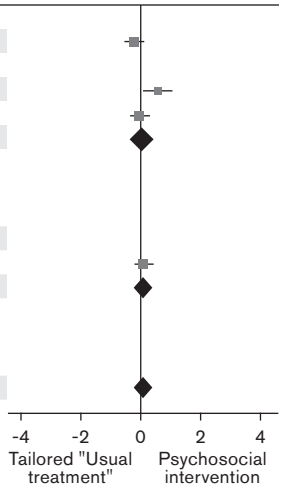
- *Self-reported pain at long term (more than 3 months):* Significant differences were detected for this outcome, taking into account the three included studies from Dworkin et al (Table 7). One study,[14] however, could not be evaluated due to incomplete data. Psychosocial interventions + tailored "usual treatment" was significantly more effective ($P = .003$; MD = 0.66; CI 0.23, 1.09) reducing pain in the long-term. There was no heterogeneity among studies, with $I^2 = 0\%$ ($P = .58$).

Secondary Outcomes: Pain interference, somatization, and depression.

- *Pain interference:* Out of four included studies,[13,14,39,40] only two reported all the needed data, with low heterogeneity ($I^2 = 0\%$, $P = .97$).[13,40] They reported a slight difference in favor of psychosocial interventions, but without meaningful differences in the interventions. Turner et al[45] registered this outcome in terms of percentage of patients who reported no pain interference at short term and long term. These results were not compatible with those from other RCTs, and consequently they were not pooled. In the long term, only one study[12]3was subject to analysis. It showed better results for psychosocial interventions, although without statistical significance ($P = .08$).
- *Muscle pain upon palpation:* No studies were found for this outcome in the short term. Only one RCT[14] provided data for muscle pain upon palpation in the long term, but without statistical significance ($P = .76$).
- *Somatization:* Somatization in the short term was reported by Dworkin et al[13,14] (Table 8). Only one of these studies[13] published complete data that favored psychosocial interventions. The results,

Table 6 Forest Plot Comparison 2: Tailored "Usual Treatment" vs Psychosocial Interventions. Self-Reported Pain at Short Term

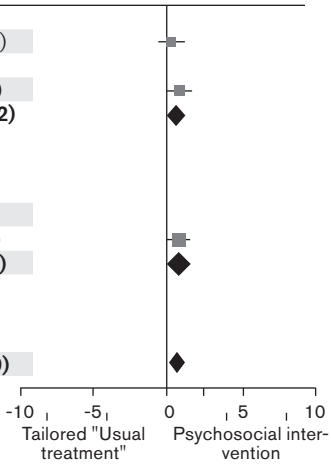
Study or subgroup	Tailored "usual treatment" Mean	SD	Total	Psychosocial intervention Mean	SD	Total	Weight	Standard mean difference IV, Random (95% CI)
Tailored "Usual Treatment" vs Psychosocial Intervention + "Usual Treatment"								
Dworkin et al[13] *(1)*	3.14	2.39	73	3.73	2.52	66	27.4%	-0.24 (-0.57, 0.09)
Dworkin et al[14] *(2)*	5.6	0	49	4.2	0	52		Not estimable
Ferrando et al[40] *(3)*	2.18	1.57	29	1.28	1.31	30	18.1%	0.62 (0.09, 1.14)
Turner et al[45] *(4)*	5.2	2.1	76	5.2	1.9	72	28.1%	0.00 (-0.32, 0.32)
Subtotal (95% CI)			**227**			**220**	**73.6%**	**0.08 (-0.34, 0.50)**
Heterogeneity: $Tau^2 = 0.10$; $Chi^2 = 7.28$, $df = 2$ ($P = .03$); $I^2 = 73\%$								
Test for overall effect: $Z = 0.38$ ($P = .71$)								
Tailored "Usual Treatment" vs Psychosocial Intervention								
Dworkin et al[39] *(5)*	3.1	1.95	63	2.9	1.85	61	26.4%	0.10 (-0.25, 0.46)
Subtotal (95% CI)			**63**			**61**	**26.4%**	**0.10 (-0.25, 0.46)**
Heterogeneity: Not applicable								
Test for overall effect: $Z = .58$ ($P = .56$)								
Total (95% CI)			**290**			**281**	**100%**	**0.07 (-0.22, 0.36)**
Heterogeneity: $Tau^2 = 0.05$; $Chi^2 = 7.51$, $df = 3$ ($P = .06$); $I^2 = 60\%$								
Test for overall effect: $Z = 0.49$ ($P = .62$)								
Test for subgroup differences: $Chi^2 = 0.01$, $df = 1$ ($P = .93$); $I^2 = 0\%$								



(1) CPI
(2) CPI
(3) MPI pain severity
(4) CPI
(5) CPI

Table 7 Forest Plot Comparison 2: Tailored "Usual Treatment" vs Psychosocial Interventions. Self-Reported Pain at Long Term

Study or subgroup	Tailored "usual treatment" Mean	SD	Total	Psychosocial intervention Mean	SD	Total	Weight	Standard mean difference IV, Random (95% CI)
Tailored "Usual Treatment" vs Psychosocial Intervention + "Usual Treatment"								
Dworkin et al[13] *(1)*	3.03	2.31	73	1.74	2.6	66	27.5%	0.29 (-0.53, 1.11)
Dworkin et al[14] *(2)*	4.5	0	51	4.1	0	56		Not estimable
Turner et al[45] *(3)*	4.7	2.3	76	3.9	2.6	72	29.5%	0.80 (0.01, 1.59)
Subtotal (95% CI)			**200**			**194**	**57.0%**	**0.55 (-0.02, 1.12)**
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 0.77$, $df = 1$ ($P = .38$); $I^2 = 0\%$								
Test for overall effect: $Z = 1.90$ ($P = .06$)								
Tailored "Usual Treatment" vs Psychosocial Intervention								
Dworkin et al[39] *(4)*	3	2.34	61	2.2	1.11	55	43.0%	0.80 (0.14, 1.46)
Subtotal (95% CI)			**61**			**55**	**43.0%**	**0.80 (0.14, 1.46)**
Heterogeneity: Not applicable								
Test for overall effect: $Z = 2.39$ ($P = .02$)								
Total (95% CI)			**261**			**249**	**100%**	**0.66 (0.23, 1.09)**
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 1.07$, $df = 2$ ($P = .58$); $I^2 = 0\%$								
Test for overall effect $Z = 3.00$ ($P = .003$)								
Test for subgroup differences: $Chi^2 = 0.31$, $df = 1$ ($P = .58$); $I^2 = 0\%$								



(1) CPI
(2) CPI
(3) CPI
(4) CPI

however, were not statistically significant ($P = .27$). Incomplete data in one study[13] reduced the estimations of the analysis to only two RCTs in the long term[14,39] with substantial heterogeneity ($I^2 = 62\%$, $P = .11$). The latter was probably linked to the psychological profile of the included patients. In fact, these RCTs were simultaneously conducted by the same research team, splitting the participants according to the Chronic Pain Grade Scale (CPGS). This instrument includes

Table 8 Forest Plot Comparison 2: Tailored "Usual Treatment" vs Psychosocial Interventions. Somatization at Long Term

Study or subgroup	Tailored "usual treatment" Mean	SD	Total	Psychosocial intervention Mean	SD	Total	Weight	Standard mean difference IV, Random (95% CI)
Tailored "Usual Treatment" vs Psychosocial Intervention + "Usual Treatment"								
Dworkin et al[13] *(1)*	0.44	0	73	0.44	0	66		Not estimable
Dworkin et al[14] *(2)*	1.3	1.5	51	1.5	1.5	56	45.8%	-0.20 (-0.77, 0.37)
Subtotal (95% CI)			**124**			**122**	**45.8%**	**-0.20 (-0.77, 0.37)**
Heterogeneity: Not applicable								
Test for overall effect: Z = 0.69 (*P* = .49)								
Tailored "Usual Treatment" vs Psychosocial Intervention								
Dworkin et al[39] *(3)*	0.5	1.4	61	0.1	1.1	55	54.2%	0.40 (-0.06, 0.86)
Subtotal (95% CI)			**61**			**55**	**54.2%**	**0.40 (-0.06, 0.86)**
Heterogeneity: Not applicable								
Test for overall effect: Z = 1.72 (*P* = .09)								
Total (95% CI)			**185**			**177**	**100%**	**0.13 (-0.46, 0.71)**
Heterogeneity: Tau^2 = 0.11; Chi^2 = 2.60, *df* = 1 (*P* = .11); I^2 = 62%								
Test for overall effect: Z = 0.42 (*P* = .68)								
Test for subgroup differences: Chi^2 = 2.60, *df* = 1 (*P* = .11); I^2 = 61.5%								
(1) SCL-90-R								
(2) SCL-90-R								

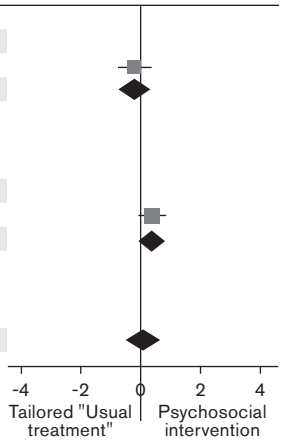
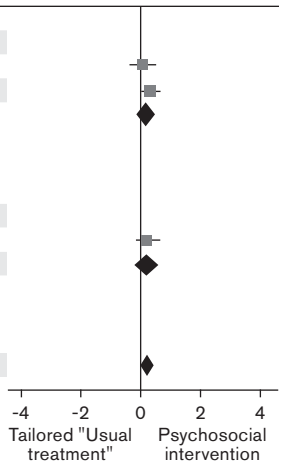


Table 9 Forest Plot Comparison 2: Tailored "Usual Treatment" vs Psychosocial Interventions. Depression at Long Term

Study or subgroup	Tailored "usual treatment" Mean	SD	Total	Psychosocial intervention Mean	SD	Total	Weight	Standard mean difference IV, Random (95% CI)
Tailored "Usual Treatment" vs Psychosocial Intervention + "Usual Treatment"								
Dworkin et al[13] *(1)*	-0.2	0	73	-0.06	0	66		Not estimable
Dworkin et al[14] *(2)*	1.2	2	51	1.1	1.7	56	29.0%	0.05 (-0.33, 0.43)
Turner et al[45] *(3)*	11.4	10.1	76	8.3	9.1	72	39.7	0.32 (-0.00, 0.64)
Subtotal (95% CI)			**200**			**194**	**68.7%**	**0.21 (-0.05, 0.46)**
Heterogeneity: Tau^2 = 0.00; Chi^2 = 1.10, *df* = 1 (*P* = .30); I^2 = 9%								
Test for overall effect: Z = 1.56 (*P* = .12)								
Tailored "Usual Treatment" vs Psychosocial Intervention								
Dworkin et al[38] *(4)*	0.5	1.4	61	0.2	1.4	55	31.3%	0.21 (-0.15, 0.58)
Subtotal (95% CI)			**61**			**55**	**31.3%**	**0.21 (-0.15, 0.58)**
Heterogeneity: Not applicable								
Test for overall effect: Z = 1.14 (*P* = .25)								
Total (95% CI)			**261**			**249**	**100%**	**0.21 (0.00, 0.41)**
Heterogeneity: Tau^2 = 0.00; Chi^2 = 1.10, *df* = 2 (*P* = .58; I^2 = 0%								
Test for overall effect: Z =2.01 (*P* = .04)								
Test for subgroup differences: Chi^2 = 0.00, *df* = 1 (*P* = .98); I^2 = 0%								
(1) SCL-90-R								
(2) SCL-90-R								
(3) BDI								
(4) SCL-90-R								



the characteristic pain intensity (CPI) and the pain interference scale. It implies that patients participating in the RCT by Dworkin et al[39] exhibit less pronounced impairments. Therefore, somatization scores may be influenced by preselection of the samples (CPGS). Results were not statistically significant (*P* = .68).

- *Depression:* Two RCTs[13,14] measured short-term depression by using the Symptom Checklist-90-Revised (SCL-R-90); however, only data pertaining to Dworkin et al[14] were fully available (Table 9). Turner et al[45] registered depression by using the Beck Depression Inventory (BDI). The overall effect of the interventions suggested

a better performance for psychosocial interventions, but this was not statistically significant (P = .09). The three RCTs by Dworkin et al provided data for long-term depression; however, complete information was not available in one of them.[13] The other two RCTs,[14,39] which had no heterogeneity (I^2 = 0%, P = .58), displayed better results for psychosocial interventions with statistical significance (P = .04; standard mean difference = 0.21; CI 0.0, 0.41).

Discussion

In this meta-analysis, only long-term self-reported pain and long-term depression were found to be significantly different for comparison 2 (tailored "usual treatment" vs psychosocial interventions), with the latter being favored (P = .003 and P = .04, respectively). This comparison included subgroups 1 and 2, and both studied CBT in all the trials. These results have to be taken into account with caution due to the limited number of studies.

It is noteworthy that when observing the different outcomes, it is possible to presume a similar trend that relates "objective" clinical signs with "usual treatment," while "subjective" outcomes are more promising following psychosocial interventions, both in the short term and long term. For instance, the psychological outcomes (depression and somatization) and pain interference exhibited in all comparisons a trend in favor of psychosocial intervention, while jaw opening was more favorable for "usual treatment."

Muscle pain had a better outcome for "usual treatment" in the long term in comparison 1 ("usual treatment" vs psychosocial interventions). Although the comparison of tailored "usual treatment" vs psychosocial interventions for this outcome did not match the authors' hypothesis, it must be considered that in that case the data (not statistically significant) came solely from a RCT that combined CBT + "usual treatment" and for which there was no short-term assessment.

In light of this, additional trials may be required to determine whether the lack of significance within the analyses is related to low statistical power or to chance. Most probably, it also may indicate that psychosocial interventions alone do not address physical functioning of a myofascial TMD pain patient.

Also interesting to note are the distinct measurements of pain in comparison 1 ("usual treatment" vs psychosocial interventions). Significant results were obtained when analyzing only studies measuring pain at long-term with the MPI, a questionnaire that combines self-reports of present and past pain with pain-interference assessments. The reviewers observed that when only actual pain reports (scored on a VAS) were considered, the results at short term favored "usual treatment." In contrast, registries of pain including memory reports (worst pain and usual pain during the last 3 to 4 weeks) exhibited a trend toward psychosocial interventions. However, both results were not statistically significant. Some authors have indicated that reports of memory of pain involve an emotional component; for instance, it has been observed that, independently of the tool used to measure pain, patients tend to overestimate past experiences of pain.[51] This implies that outcomes asking patients to recall past pain experiences probably present more accentuated scores among patients with higher somatization or catastrophizing levels.

The significant results found for comparison 2 highlight the effectiveness of CBT. In one systematic review, weak evidence was found on the effect of psychosocial interventions for the treatment of orofacial pain. The reviewed RCTs were classified as high or unclear risk of bias. However, CBT was evaluated to be the most auspicious therapy in comparison with hypnosis, relaxation, and habit reversal.[52] In another recent meta-analysis of psychological therapies for chronic pain, CBT was found more effective than a nontreatment control group, but not more than active controls. Thus, CBT seems to be effective provided that this intervention is delivered by trained personnel. The main effects of CBT on chronic pain are on over-catastrophizing and disability.[53]

The next logical question is: Do additional psychosocial interventions or specific psychosocial interventions alone provide further clinical improvements of the usual dental treatment. In other words, do psychological factors determine greater clinical success?

Two of the excluded RCTs[29,30] compared psychosocial interventions with splint therapies alone. Both studies described similar improvements for psychosocial interventions and for stabilization splint therapy. The findings, however, showed that both interventions alone are not sufficient to treat myofascial pain.

Many authors support the concept of combined therapies for the treatment of myofascial TMD pain.[8] In agreement with the preliminary observations by Dworkin et al,[14,39] there seems to be a relationship between the severity of psychological impairment and the effectiveness of "usual treatment." In further agreement, a literature review concluded that TMD patients suffering major psychological disturbances benefit more from multimodal therapies than patients without these problems.[54] It appears that patients without major psychological disturbances, including those diagnosed with disc derangement, would be responsive to simple interventions such as self-care strategies and counseling only.

The reviewers found many sources of heterogeneity among the studies: the definition of usual treatment and whether treatment was tailored to each patient (imbalanced intervention or not), the psychosocial intervention used, and the measurements of pain. However, heterogeneity measures were not significant.

Other studies of multimodal therapies based on occlusal appliances questioned the importance of the stabilization splint. One RCT[55] had over two groups receiving self-care strategies, one in combination with stabilization splint and another with a nonoccluding splint. Both groups had similar improved ranges of pain, except for the outcome of least pain, which was significantly lower for the stabilization splint group. Likewise, the study by Jokstad et al[56] showed that the type of splint was virtually irrelevant in terms of producing improvements when compared to "usual treatment" with a multimodal combination of a nociceptive trigeminal inhibition tension suppression system (NTI-tss splint) plus self-care strategies and counseling.

Although other similar combinations of therapies with splints were used in three of the included studies (using soft splints[33,44] or a NTI-tss splint[35]), this review only considered "usual treatment" when the stabilization splint was included because the supporting evidence was stronger than for other types of splints. In addition, the search strategy did not produce more results on other combinations of usual treatment.

Among the excluded studies of this meta-analysis, one study[31] used a multimodal therapy that consisted of an intraoral appliance plus stress management and EMG biofeedback for all the patients. One experimental group additionally received supportive counseling whereas the other group was treated with customized CBT. In other words, this study compared a predefined psychosocial intervention and a tailored psychosocial intervention. Both groups improved after a 6-month follow-up. In contrast, when comparing a predefined and a tailored intervention, one of the included studies[45] reported that the tailored CBT group was significantly more efficient in reducing pain, depression, and medication use. Despite the relevance of the RCT by Turk et al,[31] it did not match any comparison group in the meta-analysis (due to the presence of a cointervention consisting of EMG biofeedback) and had to be excluded. This exclusion illustrates the difficulties in the conceptualization of a "usual treatment" when no consensus exists.

The endeavor to compile different psychosocial interventions was challenging, especially because "usual treatment" incorporates two basic psychosocial interventions, namely self-care strategies and counseling. Because of this, the reviewers considered self-care strategies and counseling as a psychosocial intervention when they were applied alone, or when "usual treatment" was combined with a distinct psychosocial intervention.

Within the analyzed "usual treatments" in this review, self-care strategies and counseling aimed to increase coping abilities of the patients. Self-care strategies for TMD include different techniques to reduce muscle overloading and symptomatology, eg, relaxation training and jaw exercises. Recommendations related to soft diet and application of hot and cold packs are frequently included in the self-care strategies for TMD. These strategies proved to be sufficiently effective for the mentioned condition.[13,14]

The therapeutic goals were to give the participants a better understanding of the TMD through education and preventing symptoms through basic self-administrated physiotherapeutic interventions that could be reinforced by the prescription of analgesics[13,14,39–41,44] or muscle relaxants.[40]

In contrast, psychosocial interventions in this review aimed to enhance the coping ability of the patient tackling psychological disturbances. To this end, the reviewers grouped together self-care strategies, CBT and EMG-biofeedback.

In four included RCTs,[13,14,41,45] "usual treatment" (tailored or not) was applied to every participant, adding CBT to one of the groups. Unfortunately, statistical analysis between these studies was not viable due to the imbalance represented by the tailored "usual treatment" intervention (not every patient received the same therapy).

Quality of the Evidence

Based on additional information provided by the study authors, it was possible to clarify doubts about risk of bias in several of the studies. The reviewers justified the changes in risk of bias evaluations because every research team of the included RCTs and the studies awaiting for classification were systematically contacted. To avoid compiling biased information, the reviewers asked for explanations of every domain deemed unclear in the Cochrane Collaboration tool for assessing risk of bias. The quality of the evidence for this meta-analysis was therefore markedly better than that of other reviews (including some of the same RCTs), especially with regard to allocation concealment. Moreover, the reviewers underestimated the item for blinding of participants and personnel due to the technical difficulties of implementing it in this sort of comparison. All the trials in which the study design made the blinding of patients and operators unfeasible were assessed as low risk of bias in this domain.

Several limitations are obvious in this systematic review. The categorization that the reviewers made can be subjective, especially in terms of the definition of self-care strategies and counseling. Moreover,

the quantity of RCTs was relatively small. Usually, the reports of TMD include multiple outcomes. This multiplicity of data made it difficult to find comparative points to evaluate the impact of a therapy. Out of 44 different outcomes available within the included studies, only 6 were analyzed. The authors do not rule out that perhaps other outcomes may reflect a greater correlation between the studied interventions.

Nonetheless, it is suggested that future studies of TMD and related subdiagnoses should be reported with a minimal core of outcomes to facilitate comparisons. In agreement with the recommendations by Turk et al,[57] the reviewers in this meta-analysis addressed the first three domains for chronic pain trials (pain, physical functioning, and emotional functioning). A global assessment of the condition of the patient encompassing these different domains may help to determine whether psychosocial interventions are targeting physical functioning. Likewise, more complete reports of the mentioned key outcomes may reveal if the low effects of "usual treatment" on psychological outcomes are related to the design of the intervention or are being underreported.

In addition, the reviewers collected data mainly, but not exclusively, from myofascial pain patients. Finally, in some RCTs the "usual treatment" intervention was customized to the personal necessities of the patients. The reviewers found only five RCTs using this tailored "usual treatment." Tailored interventions (comparison 2) were not compared to balanced interventions (comparison 1) due to the high heterogeneity between these different comparisons.

In order to define a successful therapy, researchers should be concerned about the expected outcome that they want to improve. Considering that pain is the most common reason for consultation, investigators should revise the current knowledge to take into account the multidimensionality of pain. In this regard, the psychological profile of the patient may be decisive in discriminating the most effective therapy for a personalized diagnosis of TMD.

The comparison between "usual treatment" and psychosocial intervention encompasses a philosophical dilemma about the most effective approach for treatment, but even more interestingly about the etiology of TMD. Since it may not be possible to identify the specific effect of each of the therapeutic strategies herein mentioned of the components of the "usual treatment" and of the different psychosocial interventions, it is difficult to make conclusive suggestions in that regard.

Conclusions

No evidence of differences in the clinical effectiveness of "usual treatment" and psychosocial interventions alone for myofascial TMD were found. It is suggested that future studies of TMD and related subdiagnoses should be reported according to core outcomes to enable comparisons. In this meta-analysis, an approach that allows comparison of the multifactoriality of TMD, including pain (pain intensity and pain interference), physical outcomes (muscle pain upon palpation and jaw opening without pain), and psychological outcomes (depression and somatization) is proposed.

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