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Perceived helpfulness of treatments for myofascial TMD as a function of comorbid widespread pain

Vivian Santiago¹, Karen G. Raphael¹

Vivian Santiago: vs1555@nyu.edu

¹Department of Oral & Maxillofacial Pathology, Radiology & Medicine, New York University College of Dentistry, 380 2nd Avenue, Suite 301, New York, NY 10010, USA

Abstract

Objective—This study examined whether patients with myofascial temporomandibular disorder (mTMD) comorbid with fibromyalgia (FM) receive different treatments or respond differently to these treatments than mTMD-only patients.

Materials and methods—A total of 125 mTMD+ women were enrolled (26 FM+ and 98 FM–). mTMD and FM were assessed via clinical research examinations. Treatment histories and self-reported treatment-related improvement were obtained via interview.

Results—The top 3 most common treatments reported were oral appliances (59%), physical therapy (54%), and jaw exercises at home (34%). Use of alternative medicine was reported more frequently among FM+ women, but self-reported improvement did not differ by comorbid FM. Physical therapy was as likely reported by FM status but self-reported improvement scores trended higher for FM+ women.

Conclusions—Oral appliances were as likely to be reported by FM comorbid as FM– women. Oral appliances did not outperform self-management treatments on self-reported improvement of facial pain.

Clinical relevance—Results support the use of self-management as first-line treatment for mTMD and potential utility of inquiring about widespread pain for treatment planning.

Keywords

Temporomandibular disorders; Fibromyalgia; Widespread pain; Facial pain; Self-reported improvement

Correspondence to: Vivian Santiago, vs1555@nyu.edu.

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval This project underwent full ethics review and approval by the New York University School of Medicine Institutional Review Board (IRB#07-303).

Informed consent All subjects underwent and signed a full informed consent procedure before enrollment.

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Introduction

Temporomandibular disorders (TMDs) are the most common facial pain conditions [1], and the most prevalent subtype is myofascial TMD (mTMD) [2] which affects over 10% of women in the community [3]. As is common with chronic pain [4], TMDs are often comorbid with other pain conditions including widespread pain (WSP) [5, 6]. Reportedly, 7–18% of TMD patients also meet criteria for fibromyalgia [5–8], a condition characterized by WSP and diffuse tender points on palpation [9], and approximately 75% of fibromyalgia patients report myofascial TMD-like pain [10–13].

Fibromyalgia is diagnosed by a physician, usually a rheumatologist. In contrast, TMDs are usually diagnosed and treated by dentists who, despite recent Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) Axis II recommendations emphasizing the importance of assessing pain locations in the head, jaw, and body [14], do not routinely assess WSP. This is of particular importance, given that traditional TMD treatments are generally localized to the face and thus would not naturally lead to consideration of co-occurring pain in other body parts or necessarily lead to its relief. However, if treatment response is affected by co-occurring WSP, its consideration would be important for TMD treatment planning as inferred by the DC/TMD Axis II recommendations. Moreover, the efficacy and effectiveness of recommended treatments for TMDs have been somewhat elusive in clinical research and clinical care despite standard treatment practices [15]. For example, the National Institute of Dental and Craniofacial Research recommends primarily “conservative” treatments for TMDs noting that, “Because more studies are needed on the safety and effectiveness of most treatments for jaw joint and muscle disorders, experts strongly recommend using the most conservative, reversible treatments possible.”[16] Among these conservative treatments are oral appliances, pain medications such as NSAIDs, and self-care—here referred to as self-management practices—such as jaw exercises [16].

Oral appliances are a common first-line–dentist-administered treatment [17], despite conclusions from a Cochrane review of randomized clinical trials that oral appliances are no more effective than self-management activities [15]. In the USA, broad use of appliances to treat TMDs incurs significant financial cost [18]. More importantly, even when oral splints have been found to have some benefit, they have not been found to be effective for patients with comorbid WSP in the treatment of mTMD [19]. Despite the potential disconnection between this evidence and the common treatment practice reflected in the NIDCR recommendations, little is known regarding the treatments received by individuals with TMDs who also experience fibromyalgia or WSP. More importantly, it is unclear whether treatments received for facial pain are equally perceived as helpful or hurtful by TMD patients with comorbid WSP or fibromyalgia compared to TMD patients without WSP. For example, are TMD patients with WSP as likely to receive oral appliances as TMD patients without WSP and do both groups perceive oral appliances as equally helpful?

To address this research gap, this study compares the facial pain treatments reported by female patients with confirmed mTMD, with and without comorbid WSP or fibromyalgia, and examines whether patient subgroups differentially report that a given treatment helped with facial pain, made no difference, or made their pain worse. A range of treatments will be

examined, including complementary medicine approaches, but recommended first-line conservative treatments for TMD offered by dentists—self-management practices and oral appliances—will be the primary emphasis.

Materials and methods

Ethical approvals

This project underwent full ethics review and approval by the NYU School of Medicine Institutional Review Board (IRB#07-303). This included approval of a systematic informed consent procedure prior to enrollment.

Participants

Data used to examine treatment history and patient-reported treatment improvement among women who met mTMD research clinical diagnosis were drawn from an existing and completed case-control study of treatment-seeking women. Only mTMD cases were of interest for the current investigation. Women were primarily recruited from the orofacial pain dental clinic and, secondarily, by public electronic elevator postings seen by patients at the New York University (NYU) College of Dentistry. Data were collected between May 2008 and June 2011 after participants completed a full informed consent process.

Measures

Research clinical diagnoses—Potential participants were initially screened for the presence of facial pain for which they had reportedly sought care. The mTMD status was determined via examination using Axis I Research Diagnostic Criteria for TMD (RDC/TMD), Group I myofascial pain [20], by an unlicensed research clinician trained on the RDC/TMD by an external orofacial pain specialist using RDC/TMD training materials. In addition, a local orofacial pain specialist supervised the research clinician's daily work. Throughout the study period, periodic reliability checks were implemented by these local and/or external experts to determine if retraining was needed to ensure that the original standards were consistently followed and that there was not examiner drift in standards. Examination included palpation and assessment of the RDC/TMD Axis I criteria. Women were excluded if they had dental treatment within the past 48 hours since that could have caused temporary masticatory muscle pain. All women were thus rated as TMD positive or TMD negative. RDC/TMD Group I criteria were the accepted criteria at the time of data collection and have been validated (sensitivity of 0.87 and specificity 0.98) and shown to have good interrater reliability (Kappa = 0.75) [21].

Fibromyalgia status was assessed formally by a clinician during research clinical examination using the American College of Rheumatology (ACR) 1990 criteria of 11 or more tender points on palpation and report of four quadrant pain [9]. The ACR 1990 criteria have been found to have good sensitivity (88.4%) and specificity (81.1%) [9]. Since the examination could only detect individuals who met criteria at the time of examination, a broader category of any history of WSP was created that included retrospective reports. This WSP category combined 3 sources of information where a positive on any one source would indicate a positive history of WSP. These included the following: meeting ACR criteria for

fibromyalgia on clinical examination, self-reported fibromyalgia diagnosis [21] ever, or self-reported widespread pain problem using an item that asked, “In the past 6 months have you had a problem with fibromyalgia, i.e., widespread muscle aches and pain (lasting at least 3 months)?” This WSP variable was therefore broader and inclusive of research-assessed FM, capturing any self-reported WSP or lifetime self-reported diagnosis of FM. Both WSP and FM were dichotomous variables indicating meeting or not meeting criteria as defined above.

Treatment history and self-reported improvement—Trained research staff conducted participant interviews. Subjects were interviewed on a specific set of treatments for their “facial pain” and were queried on any additional treatments not included. Each treatment was assessed on whether it was current or in the past. Lifetime treatments (current or past) are reported. In addition, for each endorsed treatment, subjects were asked whether the treatment helped with their facial pain. Specifically, subjects were asked, “Did using this treatment affect your pain?” Available ordinal response options were *helped a lot*, *helped a little*, *did not help*, *made pain a little worse*, or *made pain a lot worse*. Treatment-related improvement ratings were examined in the original scale (reversed, 1 to 5 where 5 = *helped a lot*), as well as trichotomized ((1) *helped a little or a lot*, (2) *did not help*, (3) *made pain worse*) and dichotomized ((1) *helped a lot or a little* vs (0) *made pain a little worse or a lot worse*), for various analyses. No additional details on the specific treatment modality were obtained (e.g., type of physical therapy, type of oral appliance, type of massage). The items issued for measuring self-reported history of treatment had not been previously validated.

Write-in treatments were examined and coded into preexisting categories where appropriate or into separate additional categories where necessary. All treatments were also grouped in a series of larger categories. First, treatments were grouped by whether they were traditional treatments for TMD or not. These traditional treatments included oral appliances or bite plate, trigger point injection, physical therapy, transcranial electric nerve stimulation (TENS), and jaw exercises at home. All other treatments were classified as non-traditional. Second, based on clinical type, treatments were categorized into 3 variables: dental (oral appliance, trigger point injection, jaw exercises, and selective occlusal adjustment), any physical therapy including TENS, and any treatment provided by an alternative medicine provider (chiropractic manipulation, acupuncture, other provider-based). Third, all reported treatments including write-in treatments were grouped as either primarily self-management with minimal medical or appliance intervention (jaw exercises, exercise including yoga, meditation, warm compress, massage, or vocal exercise) or not.

Additional patient characteristics—Sociodemographic variables and pain-related assessments were obtained by interview. Years since onset of facial pain, characteristic pain intensity [22] (defined as the average of worst pain intensity in the last 6 months, average pain in the last 6 months, and current pain), and age of onset were obtained from the RDC/TMD Axis II patient history questionnaire which has been widely used and validated [20]. Given some evidence in the literature suggesting that depression may bias recall or accurate measurement of retrospective recall of changes in pain [23], depression symptoms were examined as a control variable. Depression symptoms were measured, as intended by

the RDC/TMD Axis II [20] with the use of the depression subscale of the SCL-90, a validated scale with good reliability (0.80 to 0.90) [24].

Statistical analyses

Descriptive statistics and logistic regression analyses were conducted using StataSE [25]. First, the proportion of lifetime facial pain treatments were examined in the full mTMD sample by individual treatment and by treatment groupings. Special attention was paid to the most commonly reported dental treatment for TMD, i.e., oral appliances. Second, potential differences in the total number and specific treatments reported by comorbid WSP and FM status were explored using chi-squared, Fisher's exact, *t* test, Spearman correlations, and non-parametric Wilcoxon rank-sum test statistics where appropriate. Third, self-reported improvement ratings as percent of women reporting each treatment who report that the treatment helped their facial pain at least a little were assessed. Finally, analyses were limited to women who reported oral appliance use in order to systematically examine what patient characteristics may predict increased odds of patient reporting that the oral appliance worked at least a little (versus "not" at least a little). To this end, a binomial logistic regression model was built in 3 steps, each using a backward-stepwise selection procedure with *p* value for entry at 0.05 and for retention at 0.10. In the first step, sociodemographic variables were included. In the second step, variables characterizing other treatments and depression were entered as control variables along with the demographic variables retained in the first step. Finally, variables characterizing patients' pain, including WSP and fibromyalgia, were added to the model.

Results

Study participants

The sample included a total of 125 myofascial TMD-positive women, based on RDC/TMD criteria [20]. Of these, 26 were assessed as having fibromyalgia (FM+) and 98 were not (FM-), based on research clinician examination using 1990 ACR criteria [9]. Additionally, a broader category of lifetime widespread pain included women meeting current research criteria for fibromyalgia (*N* = 26), self-reporting a lifetime diagnosis of fibromyalgia (*N* = 9), or reporting a problem with widespread pain in the last 6 months (*N* = 47). Thus, a total of 53 women were positive for WSP based on the above criteria which included fibromyalgia, and 72 women were negative for WSP (i.e., TMD only; neither fibromyalgia nor WSP) (Table 1).

Women ranged in age from 19 to 78 years with a median age of 37. Racial-ethnic composition was relatively diverse with 54% reporting as non-Hispanic White, 22% Hispanic, and 12% non-Hispanic Black. Most of the sample had at least a high school diploma and 25% had more than a college degree. Approximately, a third of the sample reported annual income under \$15,000.

Women reported having facial pain for a median of 7 years, with facial pain starting as early as age 10, with a median age of onset at 25. The worst facial pain intensity in the last month

ranged from 1 to 10 out of a maximum of 10 with a median of 8. Overall, characteristic pain intensity had a median rating of 5.3 out of 10.

History of treatment

Analyses include results on 9 specific non-medication TMD treatments queried during the treatment history interview and an additional 8 categories used to code “write-in” treatments. The mean number of treatments reported was 2.4, ranging from 0 ($n = 9$) to 9, median of 2. Table 2 lists the reported specific treatments and their grouping. A majority of the sample (91%) reported at least 1 of 5 common traditional TMD treatments (oral appliance, trigger point injection, jaw exercises at home, physical therapy, or transcutaneous electrical nerve stimulation (TENS)). The top 3 most common treatments reported among the full mTMD sample were oral appliances (59%), physical therapy (54%), and jaw exercises (35%).

The most common non-traditional treatments (Table 2) were acupuncture (20%) and chiropractic manipulation (18%). Exercise or yoga (7%), some form of meditation (6%), and massage (3%) were also reported, but mostly along with at least 1 traditional treatment (data not shown). Other low-frequency treatments volunteered by patients included Botox, selective occlusal adjustment, other alternative medicine approaches, and vocal exercises.

Details on concomitant treatments with the use of oral appliances—A total of 74 subjects reported ever using an oral appliance, the most commonly reported treatment. Of these, 53% were currently using an oral appliance and among these current oral appliance users, physical therapy (31%) and chiropractic manipulation (13%) were the top 2 most common concurrent treatments. Those who reported oral appliances in the past, but not currently, reported physical therapy (29%) and jaw exercises (23%) as the top 2 current treatments.

Among women who *never* used an oral appliance ($N=51$), the most common treatments were jaw exercises (53%), physical therapy (45%), and alternative medicine (26%, chiropractic and acupuncture in equal proportions).

Differences in treatments reported by fibromyalgia status or WSP—The mean number of treatments ever used did not differ by the WSP or fibromyalgia status nor did the frequency of traditional TMD treatments, including oral appliances. On the other hand, the grouping of alternative medicine treatments, including chiropractic manipulation and acupuncture, was reported more frequently among the WSP and the fibromyalgia groups compared with the TMD-only group (Table 2).

Self-reported treatment-related improvement of facial pain

Patient-reported facial pain improvement was the highest for the more common self-management-type activities. For example, among the most commonly reported self-management activities, over 84% of women reported the activity helped at least a little (84% of 44 reporting jaw exercises, 100% of 9 reporting exercise/yoga, 86% of 7 reporting meditation, 100% of 4 reporting massage, and 100% of 3 reporting warm compress). A

majority of women who reported physical therapy (84% of 68) and alternative medicine treatments like acupuncture (80% of 25) and chiropractic manipulation (81% of 21) also reported that it helped (Fig. 1).

Lowest average improvement ratings were reported for TENS and oral appliance treatments, where 50% (out of 10) and 68% (out of 72), respectively, reported it helped at least a little. In fact, some subjects reported that oral appliances (11%, $N=8$), physical therapy (3%, $N=2$), and jaw exercise (5%, $N=2$) made the pain worse. Figure 1 represents the percentage of women within each clinical category and treatment experience who reported that the given treatment helped at least a little with facial pain for the more commonly reported treatments.

Self-rated improvement among oral appliance users—Among the 72 women who reported on ratings of improvements due to oral appliances ever used, most reported that the appliance helped at least a little (68%); however, 11% reported that it made the pain worse (data not shown). The 8 subjects reporting that oral appliances made pain *a little worse* ($N=3$) or *a lot worse* ($N=5$); only 1 was currently still using the oral appliance.

In fact, among oral appliance users who also reported other self-management treatments ($n=28$: jaw exercises, warm compress, exercise or yoga, meditation, or vocal exercises), average (mean = 3.9, SD = 1.3; median = 4) self-reported improvement among oral appliances was consistently lower than even the average *lowest* score among the self-management-reported treatments when more than one self-management was reported (mean = 4.1, SD = 0.8; median = 4) on qualitative comparison. Although differences in scaled self-reported pain improvement scores did not reach significance, at the very least, the traditional treatment of oral appliances did not outperform self-management. Figure 2 shows a comparison of the dichotomized score as proportion for those who report the given treatment-type helped at least a little among those who report only 1 type of treatment (either oral appliances or at least 1 self-management treatment) and those who report both types. Among women reporting only 1 type (self-management *or* oral appliances), the proportion for whom self-management helped was significantly greater than the proportion for whom oral appliances helped ($p < .01$). However, although the general pattern is observed when comparing women who report both treatments, the results do not reach statistical significance (Fig. 2).

Predictors of self-reported facial pain improvements due to oral appliances—

What are patient characteristics that may be influencing the perception of oral appliances as helping relieve facial pain? Table 3 summarizes results of logistic regression procedures to estimate predictors of whether oral appliance use was perceived as at least a little helpful by women who report using oral appliances for TMDs. In unadjusted models, annual income greater than \$15,000 and the number of years since onset of facial pain significantly predicted increased odds of reporting that oral appliances helped at least a little. These associations persisted after adjustment for characteristic pain intensity and number of treatments reported.

Self-reported treatment-related improvement by fibromyalgia status—what hurt and what helped?—Although differences in self-reported improvement due to oral appliance use by WSP or fibromyalgia status did not reach statistical significance (reported

as percent that helped at least a little in Fig. 1), out of the 5 patients reporting that oral appliances hurt a lot, 3 (60%) were FM+. Overall, average scaled patient improvement scores did not differ significantly by WSP or fibromyalgia status for the traditional or alternative treatments as a group. However, a trend toward increased helpfulness of physical therapy treatments was found for WSP (Wilcoxon rank-sum p value = .11) and for those meeting research criteria for fibromyalgia (Wilcoxon rank-sum p value = 0.06). However, the dichotomized form of self-reported improvement represented in Fig. 1 was not significant.

Discussion

The present study explored patient-reported treatments and treatment-specific perceived pain improvement in a sample of facial pain treatment-seeking women who met research diagnostic criteria for myofascial TMD and were assessed on comorbid WSP history or current examination-based fibromyalgia. Oral appliances were the most commonly reported treatment and results on its “helpfulness” support the general findings from the clinical trials summarized below of inconclusive evidence that oral appliances outperform self-management [15, 19, 26–29].

First, it was surprising that frequency of use of oral splints was similar among FM+ as compared to FM– patients (or based on WSP status), suggesting that few dentists incorporated evaluation of widespread pain into decisions on treatment options. Although use of alternative medicine treatments was higher among FM+ patients, it appears that these were primarily in addition to oral appliance use.

Second, consistent with previous research, the self-perceived improvement related to oral appliance use was not any greater than for self-management treatments [28, 29]. The efficacy and effectiveness of oral appliances for treatment of TMD pain have been debated in the field well before the recent meta-analytic or Cochrane reviews that find no evidence for recommending or not recommending the use of oral stabilization splints for pain dysfunction syndrome which included myofascial TMD pain [15, 26]. An earlier review by Dao and Lavigne in 1998 [27] also concluded that, despite patients’ perception of positive changes due to splint use, true efficacy had not been demonstrated. Authors recommended that, given the lack of evidence for efficacy, and patient-reported satisfaction interpreted as effectiveness, “oral splints should be used as an adjunct to pain management rather than a definitive treatment” [27]. Since that time, despite some studies providing evidence of efficacy compared to none or minimal treatment [26], they prove no better when compared to usual care or self-management [15, 29], and evidence suggests that oral appliances may be particularly ineffective for individuals who also suffer with widespread pain [19]. Compared to TMD patients without widespread pain, one study found that patients suffering from widespread pain were significantly less likely to report improvements in self-reported pain or functional outcomes [19]. Most recently, a qualitative review of tailored treatments for TMDs [28] reported that splint therapies were not any better than self-management treatments such as jaw relaxation and use of thermal packs [28, 29]. Despite these findings, oral appliances continue to be a first-line treatment for TMD patients, with little consideration for the presence of widespread pain [16–18].

Third, despite the increased use of alternative medicine treatments among the FM+ group, the proportion of self-perceived improvement was not significantly higher for alternative medicine treatments. Evidence in the scientific literature on the efficacy and effectiveness of alternative and complementary medicine approaches for the treatment of chronic muscular-skeletal pain, TMD, or fibromyalgia is limited but suggestive. According to recent systemic reviews [30–33], although inconclusive with respect to superiority over other conservative methods, complementary approaches do show some positive results for treating TMDs, with the most promising evidence shown for acupuncture [32, 33] and less so for manual therapies [30, 31]. These reviews do not explore the impact of comorbid FM or WSP history, but a recent systemic overview of reviews on complementary and alternative therapies for FM suggested that exercises like Tai chi and yoga, as well as meditation and mindfulness interventions, showed positive results, while results for acupuncture and chiropractic interventions were inconsistent [34]. A recent review of complementary health approaches for pain management more generally reached a similar conclusion for FM [35].

The current study found that the frequency of alternative practitioner-based medicine approaches for mTMD to be consistent with previous research at 32% [36]. That previous study of TMD patients found that 73% of patients reported use of complementary and alternative methods for any reason and 36% specifically for a TMD. Approximately 47% of TMD patients reporting treatment found chiropractic care very helpful and 27% found acupuncture very helpful [36], similar to the proportion in the current study that reported treatment *helped a lot* (38% chiropractic manipulation and 32% for acupuncture). Inconsistency across studies in defining and measuring what constitutes a “complementary or alternative medicine” approach vs. self-management makes interpretation difficult. Nonetheless, it is clear that complementary and alternative medicine approaches are a significant resource for chronic pain sufferers, consistent with the results of the current study. Therefore, understanding their efficacy and effectiveness is important.

Fourth, although the FM+ group did not significantly report more use of physical therapy for facial pain including TENS, among those who did report using physical therapy, there was a trend toward greater self-perceived improvement scaled score due to physical therapy among the FM+ group. This suggests that research may be warranted to determine if physical therapy for facial pain may be a more efficacious option for mTMD patients with widespread pain. However, this study did not investigate specific procedures included as part of the reported physical therapy.

Regarding oral appliances, to the authors’ knowledge, no study has reported whether oral appliances may make pain worse among some patients with mTMD. Such effects may be hidden when averaging pain changes over large groups. The suggestive but inconclusive findings due to small sample size include the possibility that oral appliances may make pain *a lot worse* among women with comorbid widespread pain or fibromyalgia. This is consistent with previous research reporting oral appliances were particularly not helpful in the presence of widespread pain [19].

In these data, the strongest predictor of whether women perceived the oral appliance to be at least a little helpful with facial pain was income. The higher the income, the greater the odds

of self-reporting at least some improvement. Since all women included in the model received oral appliances, ability to access appliances due to cost is implicitly adjusted for, making this persistent association a puzzling finding. A plausible interpretation, since years of onset and characteristic pain intensity were adjusted for, is that self-perceived improvement ratings were implicitly calibrated in a sort of cost-benefit-analysis by patients as they reported on perceived improvement of their facial pain due to the oral appliance. Presumably, the higher the women's income, the more likely they were able to afford the appliance and in these data, the higher the odds that they may view any improvement as valuable. Conversely, women with lower incomes may have expected a greater improvement in their facial pain given the relative cost of the treatment and thus may rate minor improvements less favorably. It is also possible that the specific type of appliance differed for women with higher vs lower income or that it was adjusted more frequently to improve fit and comfort among higher-income women.

Limitations

Although the assessment of treatments and associated improvement was unique and appropriate for the study aims, given the use of secondary data, sample size and details on the data collected were predetermined and at times limiting. The original sample was selected on *treatment seeking* and thus self-referred rather than recruited as formal patients from a clinic receiving specific set of treatments. This is a strength as it allows for a sample that can yield a broader range of treatments as in community samples. However, it also creates greater heterogeneity and lack of standardization of treatments for interpreting results on self-reported improvements. For example, the authors did not require patients to report a specific number of years since onset or a minimum number of prior treatments to be eligible for participation. This led to a great variety of treatment combinations, some with small Ns for examining improvements. However, both years since onset of facial pain and number of treatments reported were explored as covariates with little influence on results.

Relatedly, we do not have any measure of adherence to treatment which should be taken into account when considering the implications of our findings, as failure to adhere to the prescribed length and nature of treatment protocol may have influenced ratings of facial pain improvement. Nonetheless, this analysis is intended to represent what patients do in real-world settings rather than in controlled circumstances. If, in this highly motivated patient population, a treatment is too difficult or not immediately helpful, adherence may be low and reflected in lower improvement scores. Alternatively, improvement may lead to premature discontinuation of treatment, reflecting higher improvement scores with lower adherence. These data do not address adherence.

Sample size of the FM+ group is a limitation that is unavoidable in such sampling methods when research diagnosis on covariates is assessed after inclusion and has not been purposefully oversampled. This is particularly true, given the many treatments explored, some with a small frequency. To address these limitations, treatments were grouped together to increase the frequency for comparisons. In general, as in other research on treatment and complementary approaches where consensus on groupings has not been established, the authors proceeded with the most parsimonious approach to maximize data and statistical

power, informed by reported practice in the literature. In addition, because of the possibility that past FM may not be reflected in current research clinical examination, a broader definition of widespread pain that also allowed for a larger sample size was included. Nonetheless, this study cannot rule out that additional small magnitude differences in treatment or self-reported improvement may exist by FM/ WSP status. Even using the larger TMD+WSP pain group ($N=53$) vs the TMD-only group ($N=72$) allows 80% power to estimate only relatively large differences in the proportion helped by treatment between group, i.e., .25 or greater. Another noteworthy limitation is that comorbid TMD subtypes were not measured and thus this study cannot speak to how such comorbidity with articular subtypes may have impacted the results.

Although not a limitation for the purpose of the study, use of self-report for treatment and treatment-related improvements does limit generalizability of the results. Only the use of facial pain treatments and their helpfulness were specifically queried. Details on each treatment modality and delivery were not obtained. For example, details were not obtained on specific types of physical therapies or oral appliance type or specific fitting protocol. Therefore, authors could not explore differences in perceived helpfulness by the treatment details.

In addition, this study did not examine treatment-related changes in real-time pain intensity measures over time, but relied on retrospective self-reported treatment-related improvement. However, because each treatment reported was separately assessed on its patient-perceived impact on facial pain, these are uniquely informative data based on patient self-perceived positive or negative experience with the given treatments. To the authors' knowledge, few studies assess self-reported pain improvement considering each individual treatment and fewer, if any, include possible worsening of pain as a result of each treatment. More importantly, clinicians rely heavily on self-report of prior treatment and on self-report of whether a given treatment is working. Understanding how patients report on these treatments in systematic research is therefore an important compliment to evidence from rigorous intervention trials.

The focus of these analyses is non-medication-based treatments. However, medication use was common, with lifetime use of at least 1 medication for facial pain reported by 74% of the sample, primarily non-steroidal anti-inflammatory medications. It is beyond the scope of the current investigation to assess how concurrent or past medication use may relate to these non-medication treatments or their patient-perceived improvements. The authors did explore whether the number of medications ever used for facial pain predicted self-reported helpfulness of oral appliances and it did not add significantly to the model (Table 3). Similarly, authors did not conduct an equally detailed interview on treatments for fibromyalgia or WSP specifically. All treatment queries were prompted by a request to focus on facial pain. Therefore, it is unclear whether treatment for other pain outside the orofacial region may have influenced the above-noted results.

Conclusions

Oral appliances were the most common treatment reported in this treatment-seeking sample of mTMD cases and as likely to be reported among women with widespread pain or fibromyalgia despite clinical trial evidence of their particular ineffectiveness in the presence of widespread pain [19]. Oral appliances, however, did not outperform self-management treatments in the self-reported improvement of facial pain, also consistent with existing evidence [15, 26, 28, 29].

Results from this sample of women with mTMD suggest that patients who also meet fibromyalgia diagnostic assessment or report a history of WSP may be more likely to report the use of alternative medicine therapies and may perceive greater benefit from physical therapy treatments than mTMD-only patients. Although alternative medicine treatments were approximately twice as frequent among fibromyalgia or WSP-positive subjects, self-reported improvement of facial pain due to alternative medicine treatments did not differ significantly by fibromyalgia or WSP status.

These data support the conclusion reached by the Cochran review of clinical trials that oral appliances as first-line treatment for individuals with mTMD, and especially those with comorbid widespread pain, may not be more effective than self-management [15, 19, 26, 28, 29]. Moreover, future studies should consider whether appliances make pain worse. As such, self-management activities—a less costly option—and potentially physical therapy may be most feasible as first-line treatments, especially for patients comorbid for WSP or fibromyalgia.

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Fig. 1.

Self-reported improvement in facial pain by treatment and disorder status. The proportion of women reporting that treatment *helped at least a little* did not differ significantly by treatment or comorbid disorder status. *Maximum number of subjects reporting each treatment* (by all mTMD, mTMD only, mTMD+WSP, mTMD+FM, respectively): oral appliances, 72,45,27,14; jaw exercises, 44,24,20,10; trigger point injections, 17,9,8,4; physical therapy, 68,34,34,17; TENS, 10,4,6,3; chiropractic, 21,7,14,6; acupuncture, 25,10,15,7. *mTMD* = myofascial temporomandibular disorder; *WSP* = widespread pain inclusive of any FM diagnosis; *FM* = fibromyalgia clinical research diagnosis; *TENS* = transcutaneous electrical nerve stimulation; *helped* = dichotomized as “helped a little” or “helped a lot” vs “did not help”, “made pain a little worse” or “made pain a lot worse”

Fig. 2.

Comparison of self-reported facial pain improvement: oral appliance vs. self-management treatments. **a** Among women reporting one or the other, the proportion of women reporting that self-management helped was greater than proportion of women reporting oral appliance helped ($*p$ value < 0.01). **b** Among women reporting both types of treatments, difference did not reach statistical significant in percent reporting treatment helped (p value = 1)

Table 1

Sample sociodemographic and clinical characteristics of mTMD+ treatment-seeking women

Characteristic	N	Measure
Age (years)	125	
Range		19 to 78
Mean (SD)		40.1 (14.9)
Median		37
Education (%)	123	
High school or less	27	22
> HS, < college	65	53
> = college	31	25
Income (%)	119	
< 15,000	35	29
15,000 to < 50,000	41	34
> 50,000	43	36
Hispanic (%)	27	22
Age of facial pain onset	125	
Range		10 to 66
Mean (SD)		29.5 (13.7)
Median		25
Years since facial pain onset	125	
Range		0.33 to 50
Mean (SD)		10.6 (10.5)
Median		7
Worst pain intensity in last month	125	
Mean (SD)		7.6 (2.1)
Median		8
Characteristic pain intensity	125	
Mean (SD)		5.2 (1.7)
Median		5.3
Number of treatments ever for facial pain (Mean (SD))	125	2.4 (1.6)
Number of medications ever for facial pain (Mean (SD))	125	1.9 (1.6)
Fibromyalgia (ACR examination) (%)	26	21
Widespread pain, ever (%)	53	42

mTMD, myofascial temporomandibular disorder; *SD*, standard deviation; *ACR*, American College of Rheumatology

Table 2

Patient-reported mTMD treatments by widespread pain and fibromyalgia status

	All mTMD			Widespread pain				ACR research diagnosis fibromyalgia									
	N =125			WSP +		N =53		TMD only		N =72		FM+		FM−		N =98	
	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	p value
Pre-coded treatments																	
Oral appliance or bite plate	59	74	53	28	64			46	58	15	60	59				59	0.82
Physical therapy	54	68	64	34	47			34	65	17	52	51				51	0.27
Jaw exercise (at home)	35	44	38	20	33			24	38	10	35	34				34	0.72
Acupuncture	20	25	28	15	14			10	27	7	18	18				18	0.41
Chiropractic manipulation	18	22	28	15	10			7	27	7	14	14				14	0.15
Trigger point injection	14	17	15	8	13			9	15	4	13	13				13	0.75
TENS	8	10	11	6	6			4	12	3	7	7				7	0.44
Biofeedback	4	5	6	3	3			2	0	0	5	5				5	
Write-in treatments																	
Exercise/yoga	7	9	6	3	8			6	8	2	7	7				7	
Meditation/breathing	6	7	9	5	3			2	12	3	4	4				4	
Warm compress	2	3	4	2	1			1	4	1	2	2				2	
Massage	3	4	4	2	3			2	4	1	3	3				3	
Botox	2	2	4	2	0			0	4	1	1	1				1	
Other alternative medicine practice	2	2	4	2	0			0	8	2	0	0				0	
Selective occlusal adjustment	1	1	0	0	1			1	0	0	1	1				1	
Vocal exercise	1	1	0	0	1			1	0	0	1	1				1	
Any traditional TMD treatment	91	114	96	51	88			63	100	26	90	88				88	0.12
Any non-traditional TMD treatment	45	56	60	32	33			24	62	16	40	39				39	0.05
Any alternative medicine	32	40	49	26	19			14	50	13	27	26				26	0.03
Any self-management treatment	45	56	49	26	42			30	50	13	44	43				43	0.58

Traditional treatments = oral appliance, physical therapy for facial pain, jaw exercises at home, trigger point injections, and transcutaneous nerve stimulations (TENS); Any nontraditional treatment = all others not included in traditional treatments; Any alternative medicine = chiropractic manipulation, acupuncture, other practitioner-based treatment; Any self-management = jaw exercises, warm compress, exercise or yoga, meditation or breathing exercise, massage including inverted table, and vocal exercises. Italic estimates are significant at p value < 0.10

Table 3

Predictors of oral appliance–related improvement* in self-reported facial pain: logistic regression models

	<i>N</i>	Unadjusted models ^a		Adjusted model ^b	
		Odds ratio	95% CI	Odds ratio	95% CI
Age (years)	72	1.02	0.98, 1.06	–	–
Hispanic ethnicity	70	0.4	0.10, 1.54	–	–
Education>HS	70	0.58	0.16, 2.09	–	–
Income > 15,000	72	<i>3.86</i>	1.21, 12.28	<i>6.06</i>	1.49, 24.64
Number of medications-lifetime	72	1.00	0.76, 1.31	–	–
Number of treatments-lifetime	72	1.46	0.98, 2.16	<i>1.77</i>	1.03, 3.04
Depression score	72	0.90	0.46, 1.77	–	–
Years since onset of facial pain	72	<i>1.12</i>	1.02, 1.20	<i>1.14</i>	1.04, 1.25
Characteristic pain intensity	72	0.86	0.66, 1.13	<i>0.63</i>	0.43, 0.93
FM ACR research diagnosis	72	0.81	0.24, 2.76	–	–
Widespread pain present	72	0.69	0.25, 1.90	–	–
Likelihood ratio chi-square					24.55
<i>p</i> value					0.0001
<i>N</i>					72

^a Each odds ratio was estimated in separate unadjusted models; italic odds ratios represent significance at $p < 0.05$

^b A series of cumulative backward-stepwise selection procedures in 3 steps starting with demographic variables, treatment-related variable including depression score, and finally pain characteristic variables; $p < 0.05$ entering variable and $p > 0.10$ for retaining variables in the model at each step. Only the final model is presented because it includes all of the variables retained at each step

* Helped at least a little (1) vs did not help at least a little (0)