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Review articles

Manual therapy for temporomandibular disorder in older adults: an integrative literature review

Laiza de Oliveira Lucena[1]
https://orcid.org/0000-0002-2158-0791

Camila Maria Mendes Nascimento[1]
https://orcid.org/0000-0002-2223-4196

Nadja Maria Jorge Asano[1]
https://orcid.org/0000-0003-3644-7333

Maria das Graças Wanderley de Sales Coriolano[1]
https://orcid.org/0000-0002-7937-7761

Carla Cabral dos Santos Accioly Lins[1]
https://orcid.org/0000-0002-1018-5331

[1] Universidade Federal de Pernambuco, Recife, Pernambuco, Brasil.

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Corresponding address:
Laiza de Oliveira Lucena
Rua 80, Quadra 57, Bloco 8, Apt. 405 - Maranguape 1
CEP: 53441070 - Recife, Pernambuco, Brasil
E-mail: laizalucenaa@live.com

ABSTRACT

Purpose: to describe the manual therapy techniques used to treat the temporomandibular disorder in older adults.

Methods: an integrative literature review assessing scientific publications indexed in six databases: MEDLINE/PubMed, Web of Science, CINAHL, Scopus, LILACS, and PEDro. Only intervention studies were included, with no restriction of date or language. The articles included in the review were assessed with the Critical Appraisal Skills Programme.

Results: after consulting the databases, 88 articles were found, six of which were considered eligible. No study was found exclusively approaching older adults. According to the analysis of the risk of bias, two articles were classified as low-risk, two as intermediate, and two as high-risk. The manual therapy techniques were intra- and extraoral massage, temporomandibular joint and cervical spine mobilization, myofascial release, trigger-point finger pressure, and deep transverse massage.

Conclusion: the studies observed improved mandibular movements and masticatory function, eased pain, and reduced anxiety.

Keywords: Aged; Musculoskeletal Manipulations; Temporomandibular Joint Disorders

INTRODUCTION

During the aging process, the temporomandibular joint (TMJ) – the only movable joint in the head – may be overloaded[1]. For the TMJ to function properly, it must be in perfect harmony with dental occlusion and neuromuscular balance[1,2]. Factors present in older adults, such as parafunctional habits, deficient occlusion, and tooth loss, may result in temporomandibular disorder (TMD)[3] – which is a set of disorders involving functional and structural changes in the stomatognathic system that may affect joints, muscles, or both[4]. It is characterized by symptoms such as the reduced amplitude of mandibular movement, pain, headaches, noises, and limited mandibular mobility[4]. TMD signs may also manifest in the neck regions, face, and occipital, temporal, and frontal areas of the head[5]. At least 40% of the adult population is estimated to be presented with some of these disorder symptoms[6].

The cause of TMD is multifactorial. It may result from direct or indirect trauma, psychosocial factors (depression and anxiety), systemic factors (degenerative, infectious, metabolic, neoplastic, and rheumatologic diseases), and physiopathological and genetic factors[7]. As for TMD prevalence in older adults, there is a disparity in the data. It is believed to be more frequent in this population than what has been reported in the literature, to which a possible explanation would be the different diagnostic methods used in research[8-10]. TMD may have an impact on the quality of life of this age group. Miettinen et al.[11] assessed the association between psychosocial aspects, TMD, and oral health quality of life and showed that the TMD group had a lower quality of life when assessed with the Oral Health Impact Profile (OHIP). They scored 90.9, three times higher than the 33.3 points of the non-TMD group.

There is a wide range of TMD treatments, which depend on good assessment to establish the most appropriate intervention[12-14]. The conservative treatment may include self-care instructions, psychological and pharmaceutical interventions, acupuncture, occlusal splints, physical therapy[14], and orofacial myofunctional therapy[15,16]. One of the most common conservative interventions to treat TMD is manual therapy[17,18]. Making use of mobilization, manipulation techniques, and specific exercises, it aims to increase the elasticity of the adjacent muscle fibers, stimulate proprioception and production of synovial fluid, and ease the pain[19-21]. The sample of most clinical trials using this resource to treat TMD comprised adults rather than specifically older adults[21-27]. Hence, the objective of this review is to describe the manual therapy techniques used to treat TMD, in older adults.

METHODS

This descriptive study is an integrative literature review, which synthesizes the scientific knowledge on a given topic[28]. Six methodological stages conducted the study: (1) establishing the research question; (2) searching the literature; (3) assessing the data; (4) categorizing the studies; (5) interpreting the results and integrating the data; and (6) presenting the integrative review. The review was conducted by the following research question: "Which manual therapy techniques have been used to treat TMD in older adults?".

Scientific articles were searched in January 2020 in the following databases: MEDLINE/PubMed (Medical Literature Analysis and Retrieval System Online), Web of Science (bibliographic database), CINAHL (The Cumulative Index to Nursing and Allied Health Literature), Scopus (bibliographic database), LILACS (Latin American and Caribbean Health Sciences Literature), and PEDro (Physiotherapy Evidence Database).

In order to broaden the scope of the search, there was no restriction of language or year of publication. The following descriptors were used: aged, musculoskeletal manipulations, and temporomandibular joint disorders (based on MeSH – Medical Subject Headings), and their correspondent in Portuguese: *idoso*, *manipulações musculoesqueléticas*, and *transtornos da articulação temporomandibular* (based on DeCS – Health Sciences Descriptors); they are described in Chart 1. This review included intervention studies that approached manual therapy techniques to treat TMD in older adults, whereas it excluded review articles, case reports, and publications not available in full text or whose results had not yet been published.

Chart 1. Database search strategy. Recife, Pernambuco, Brazil, 2020

Database	Search strategy
MEDLINE/PubMed	(Manipulations[All Fields] AND (``joint``[All Fields] AND ``diseases``[All Fields]) OR ``joint diseases``[All Fields] OR (``joint``[All Fields] AND ``disorders``[All Fields]) OR ``joint disorders``[All Fields)) AND (´´aged´´[MeSH Terms] OR ``aged``[All Fields])
Web of Science	(musculoskeletal manipulations) AND (temporomandibular joint disorders) AND (aged)
Scopus	TITLE-ABS-KEY (musculoskeletal AND manipulations AND temporomandibular AND joint AND disorders AND aged)
LILACS	*Idoso* [subject descriptor] and *manipulações musculoesqueléticas* [subject descriptor] and *transtornos da articulação temporomandibular* [subject descriptor]
PEDro	aged musculoskeletal manipulations temporomandibular joint disorders

The studies were selected in two stages: reading of titles/abstracts and then reading preselected articles in full text. The first stage was conducted by the lead researcher, who classified the potentially eligible articles based on the inclusion and exclusion criteria, dismissing the duplicate studies. The second stage was conducted by two independent investigators, who read the selected articles in full text. Divergences during the selection process were solved by independently consulting a third reviewer to ensure the reliability and validity of the study in question. The variables selected for the study were pain, mandibular mobility, limitation of mouth opening, and psychosocial changes.

The Critical Appraisal Skills Programme (CASP)[28] was applied to obtain a better critical and methodological analysis of the included articles. This clinical trial checklist has 11 questions that can be answered with "yes", "no", or "cannot tell". The first three are screening questions and they are quickly answered; if they are answered "yes", it is worthwhile to proceed to the following questions and continue the review assessment.

LITERATURE REVIEW

After consulting the databases, 88 articles were found, of which six were excluded for being duplicates and 64 were excluded after analyzing their titles. Hence, 18 were assessed for eligibility, remaining six articles, which comprised the final sample[29-34] (Figure 1).

The information compiled from the included articles – author/year, objectives, variable, intervention, results, and conclusions – is presented in Chart 2.

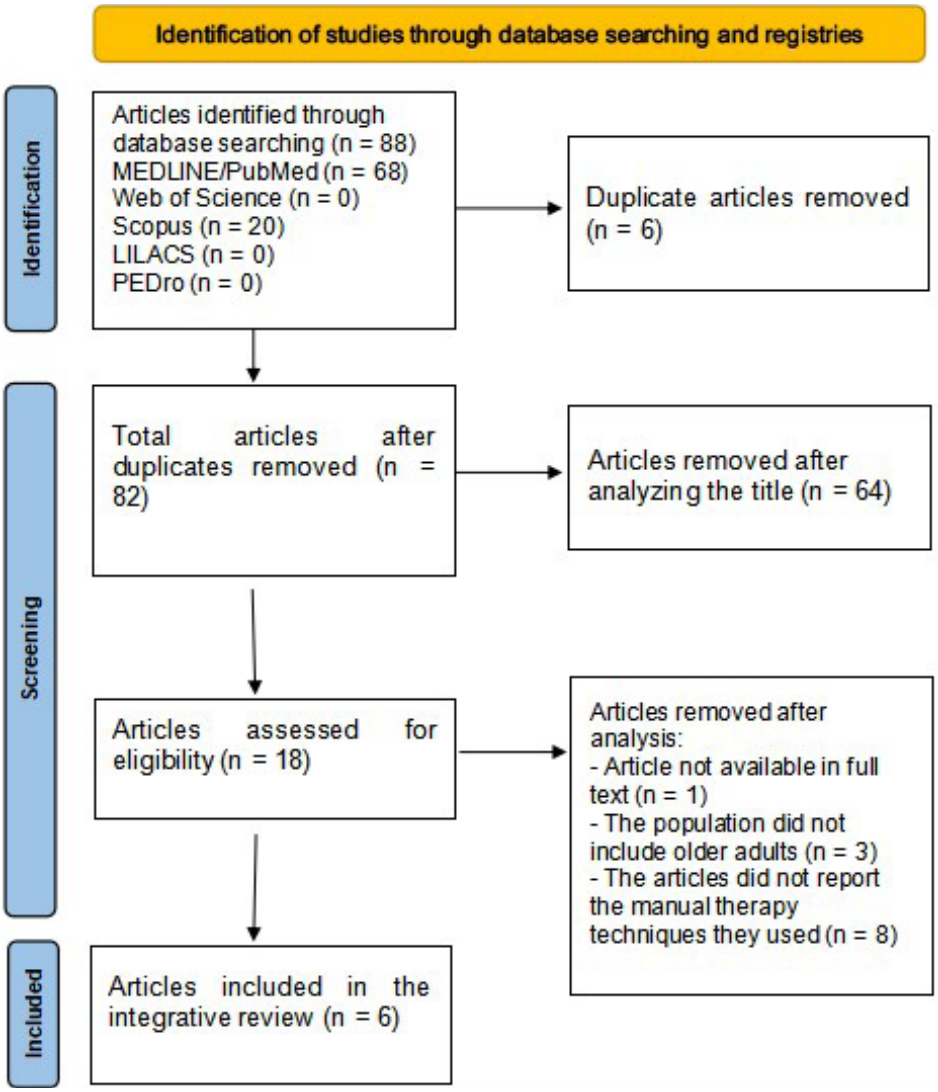

Figure 1. Flowchart of the stages in the article selection process, according to PRISMA. Recife, Pernambuco, Brazil, 2020

Chart 2. Compiled description of the studies included in the review. Recife, Pernambuco, Brazil, 2020

Author (Year)	Sample/Age	Objective	Variables Studied	Intervention	Result/Conclusion
Brochado et al., 2018[29]	51 participants/ 21-77 years old	To compare the effectiveness of photobiomodulation and manual therapy, both alone and in combination, to treat the pain, limited movements, psychosocial disorders, and anxiety symptoms in people with TMD.	Pain, limited mandibular movement, psychosocial disorders, and anxiety symptoms.	Photobiomodulation Group: The GaAlAs diode laser was used in the following parameters: 808-nm wavelength, punctual mode, 100-MW power, 40 s, and 4-J total energy per point. The laser was applied 12 times (3 times per week, for 4 consecutive weeks). Manual Therapy Group: Three 21-minute weekly sessions in the masticatory muscles and TMJ for 4 consecutive weeks. Combined Therapy Group: The group was submitted to both protocols for 4 consecutive weeks.	The protocols tested eased the pain and improved the mandibular movements, reducing the negative effects of the psychosocial aspects and anxiety symptoms. However, the combined therapy did not potentialize the effect of either therapy alone.
Tuncer et al., 2013[30]	40 participants/ 18-72 years old	To determine the effectiveness of treatments for pain intensity and maximum mouth opening without pain in patients with TMD.	Pain and maximum mouth opening without pain.	Home Physical Therapy Group: Education on the pain, ergonomic instructions, respiratory exercises, relaxation techniques, postural correction exercises, and mandibular exercises, stretching, mouth opening and closure, and resisted exercises. Home Physical Therapy + Manual Therapy Group: Home physical therapy protocol combined with manual therapy: soft tissue mobilization (intra- and extraoral massage), TMJ mobilization (caudal, ventral-caudal, ventral, and mediolateral traction), TMJ stabilization, coordination exercises, cervical mobilization, and post-isometric relaxation and stretching techniques for the masticatory and neck muscles. The interventions lasted 30 minutes, 3 times a week, for 4 weeks.	The manual therapy in combination with home physical therapy was more effective to treat TMD than physical therapy alone, concerning eased pain and maximum mouth opening without pain.
Von Piekartz & Hall, 2013[31]	43 participants/ 18-65 years old	To investigate whether orofacial physical therapy treatment brings any benefits in comparison with usual care to improve from impaired cervical movement in people with headache and mixed characteristics of cervicogenic headache and TMD signs.	Pain and cervical mobility.	Orofacial Care Group: The objective was to approach masticatory trigger points, TMJ restriction, and, when necessary, techniques to desensitize the cranial tissue, and home exercises. In the analysis of this group, the therapist provided and additional treatment for the cervical region to approach the cervical components of the disorder. Usual Care Group: Received only individualized cervical manual therapy, with cervical mobilization and, if necessary, high-speed techniques, stretching, strengthening, and other home exercises involving the cervical region. Both groups received a total of six 30-minute sessions, for 3 to 6 weeks.	Orofacial treatment besides usual care with manual therapy focused on the cervical spine was more effective to improve impaired cervical movement than usual care alone in people who suffer from headaches with cervical impairment and TMD signs.
Guarda-Nardini et al., 2012[32]	30 participants/ 23-69 years old	To verify and compare the effectiveness of two approaches: fascial manipulation techniques and botulinum toxin injections for 3 months in patients with myofascial pain in the mandibular muscles.	Pain and amplitude of mandibular movement.	Protocol A: Botulinum toxin – the patients were submitted to a single session with multiple injections of botulinum toxin in the masseter and temporal muscles. Protocol B: Fascial manipulation techniques – the patients were submitted to a fascial manipulation session, involving deep finger pressure on the muscle of the temporal, frontal, sternocleidomastoid, and trapezius regions. The interventions comprised three 50-minute sessions a week with fascial manipulation, for 2 to 4 weeks.	Both treatments improved the pretreatment levels of pain. In the short run (3 months), both treatments seemed to be almost equally effective – fascial manipulation was slightly superior in decreasing the subjective perception of pain, while the botulinum toxin injections were slightly superior in increasing the amplitude of mandibular movement.

Author (Year)	Sample/Age	Objective	Variables Studied	Intervention	Result/Conclusion
Barriere et al., 2009[33]	15 participants/ 15-64 years old	To assess the Cyriax deep transverse massage technique in people with the pain-dysfunction syndrome in the masticatory system.	Pain, mouth opening, and TMJ crepitation.	For the Cyriax massage, the patients remained seated. It was performed for 30 seconds on the most tense region of the lateral pterygoid muscle, as observed in the clinical examination.	It was verified that the Cyriax massage was more positive in patients with severe joint blockage.
De Laat, Stappaerts, & Papy, 2003[34]	26 participants/ 16-66 years old	To prospectively assess the effectiveness of a treatment involving instructions and physical therapy in a group of patients with myofascial pain in the masticatory system and investigate whether the duration of the physical therapy (4 vs. 6 weeks) would influence the treatment results.	Pain and mandibular movement.	Instruction: All patients received information on their pain etiology and instructions on how to relax the masticatory muscles. Physical therapy: continuous ultrasound for 5 minutes, massage on the masseter and temporal muscles for 10 minutes, stretching of the masseter muscle for 5 minutes, repeat the massage for another 5 minutes, instruct the patient to perform the massage twice a day and apply hot compression for 20 minutes in the evening. Group I: 4 weeks Group II: 6 weeks.	After 4 and 6 weeks of combined treatment, a sharp improvement was observed in both groups, confirming the effectiveness of the conservative treatment for myofascial pain in the masticatory muscles.

Captions: TMJ: temporomandibular joint; TMD: temporomandibular disorder; GaAlAs: gallium aluminum arsenide; nm: nanometer; MW: megawatt; s: seconds; J: joule.

Five (83.3%) of the articles included in this review were published in English[29-32,34], while one (16.7%) was published in French[33]. As for the date, one article was published in the last 5 years[29], three in the last 10 years[30-32], and two, more than 10 years ago[33,34]. All studies were clinical trials whose objectives were to assess a manual therapy technique protocol, either alone or in combination with other interventions in people with TMD, regarding a wide range of outcomes, such as pain, mandibular mobility, limited mouth opening, psychosocial changes, and so forth[29-34]. During the research, no study approaching exclusively older adults was found – the studies included in this review approached a combination of young people, adults, and older adults[29-34]. The sample size of the studies ranged from 20 to 51 participants of both sexes, aged 15 to 77 years[29-34].

The studies included in this review used manual therapy techniques, either alone or in combination with other interventions, such as photobiomodulation[29], home physical therapy (which involves stretching, postural correction, and active mandibular exercises)[30], instructions[34], usual care[31], and botulinum toxin injections[32] in participants of various ages. The participants of the botulinum toxin group were submitted to a single session with multiple injections in the masseter and temporal muscles[32].

Although most studies[29-34] clearly approached the technique protocol used, one of the main biases in the articles was the blinding process[29-34] regarding both the sample and the study participants. However, only one article did not perform the randomization[33], which made the sample more homogeneous, despite the variety of ages. All the articles counted the total participants in their conclusions[29-34], informing the losses to follow-up throughout the clinical trial. The groups were similar in approximately 67% of the studies[29-31,34]; however, the assessment with CASP revealed that none of them had a control group that received the same treatment as the intervention group.

Three articles did not inform their treatment effect measure[29,31,34], which concerns the estimate of the relationship magnitude between the variables, the difference between the samples, and the effect of one variable on another[34]. The papers did not make clear the precision of this measure[30-35], thus compromising the identification of their result as clinically important. In the assessment, three studies[29,30,34] demonstrated that the benefits of their therapies were greater than the risks and harms. Thus, the analysis of the risk of bias classified two articles as low-risk[30,34], two as intermediate[29,31], and two as high-risk[32,33]. The CASP article assessment is fully described in Chart 3.

Chart 3. Assessment of the articles with the Critical Appraisal Skills Programme (CASP)[28] for clinical trial studies

Article Author (year)	CASP										
	Focused question	Randomization	Counting the patients	Blinding	Similarity between the groups	Equal treatment as the intervention group	Treatment effect	Precision of the effect estimate	Application of the results	Clinically important results	Benefits
Brochado et al., 2018[29]	Y	Y	Y	N	Y	N	CT	CT	Y	CT	Y
Tuncer et al., 2013[30]	Y	Y	Y	N	Y	N	Y	CT	Y	Y	Y
Von Piekartz & Hall, 2013[31]	Y	Y	Y	CT	Y	N	Y	CT	N	CT	N
Guarda-Nardini et al., 2012[32]	N	Y	Y	CT	N	N	N	N	CT	N	CT
Barriere et al., 2009[33]	N	N	Y	N	N	N	N	N	N	N	CT
De Laat, Stappaerts & Papy, 2003[34]	Y	Y	Y	N	Y	N	Y	CT	Y	Y	Y

Caption: Y: yes; N: no; CT: cannot tell.

This review did not identify any research approaching manual therapy TMD treatment exclusively in older adults. Moreover, the sample size and their short follow-up were limitations in most articles, which made it difficult to identify the actual effects of their interventions[29-34].

Brochado et al.[29] used Axis I of the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) in their study to diagnose TMD. The participants had to present with TMJ pain and limited mouth opening. De Laat et al.[34] likewise used Axis Ia in their research to diagnose the sample; those with dull localized pain in the face for more than 1 month and muscles sensitive to palpation were included. The RDC/TMD, besides the physical methods to diagnose TMD in Axis I, addresses pain intensity and depressive symptoms in Axis II. Hence, it is an excellent way of diagnosing this disorder[35].

The females predominated in all papers included in this review. The most recent one, published in 2018[29], showed an extremely high prevalence of women (95.1%) with a TMD diagnosis, whose ages ranged from 21 to 77 years. Similarly, the sample of research published in 2009[33] comprised 93.3% of female participants. In another study, published in 2013[30], such prevalence was 77.5%. The article that compared physical therapy treatment with usual care in people with cervicogenic headache and signs of TMD showed a little smaller prevalence of women, with 62.8%[31]. In an article published in 2012[32], the prevalence of women in the sample was 73.3%, while another one, published in 2003[34], had 22 women out of the 26 participants, corresponding to 84.6%.

Pain, as it is the main symptom observed in TMD patients[34], was the most studied variable among the papers. The visual analog scale (VAS) was the most used to measure the pain among the participants[29-32,34], as only one piece of research did not use it[33]. Other signs and symptoms were also observed, which made part of the everyday life of people with TMD, such as depressive symptoms, assessed with the Beck Depression Inventory[29]; maximum mouth opening without pain, measured in millimeters[30]; limited amplitude of cervical movement[31]; pressure pain threshold, assessed with algometry[34]; mandibular function, using the mandibular functional limitation questionnaire[34]; and mandibular movements (mouth opening, right and left laterotrusion, and protrusion)[32].

Various manual therapy techniques were used to treat TMD. The protocol in the study by Tuncer[30] included intra- and extraoral massage of the masticatory muscles, TMJ and cervical spine mobilization, TMJ stabilization, and stretching. Barriere et al.[33] investigated the use of deep transverse massage applied transversally with continuous and deep pressure on the tissues to restore mobility, ease the pain, and prevent scar adherence[31]. Another protocol[32] performed circular massages, sliding and compressing proximal and distal face areas, on the masseter, temporal, and medial pterygoid muscles, bilaterally. Yet another protocol approached the cervical spine, including cervical mobilization, high-speed techniques, trigger

points approach, and neck muscle stretching and strengthening[31].

Only one article[33] performed a protocol with manual therapy techniques alone; the other papers compared the effectiveness of these techniques with that of various interventions. One study[30] compared home physical therapy alone with home physical therapy in combination with manual therapy techniques concerning pain intensity and maximum mouth opening without pain. Another one[32] compared myofascial manipulation with a single bilateral application of botulinum toxin injections in the masseter muscle. Manual therapy was also compared with photobiomodulation[29] to treat the pain, limited movements, psychosocial disorders, and anxiety symptoms. Orofacial care[31] and instructions[34] on how to relax the mandibular muscles were also investigated in other pieces of research.

The manual therapy treatment lasted 4 weeks on average, with three sessions a week. One protocol performed three 21-minute sessions a week, totaling 4 weeks[29]. The protocol used by Tuncer et al.[30] likewise had three sessions a week for 4 weeks, although each intervention was longer, lasting 30 minutes. One of the studies did not inform the number of sessions or the total time of therapy; it only indicated the maneuver application time in each muscle, which was 30 seconds[33]. The protocol that used myofascial manipulation as a manual therapy technique had the longest intervention of all studies included in the review, with 50 minutes of therapy performed three times a week for 2 to 4 weeks[32].

Regarding the results, the study that compared manual therapy, photobiomodulation, and combined therapy (manual therapy + photobiomodulation) to treat TMD stands out. It showed an improvement in the amplitude of mandibular movements, masticatory functions, nonspecific physical symptoms, as well as a decrease in anxiety symptoms, though without a statistically significant difference between the groups[29]. Another paper[30] showed that the maximum mouth opening without pain was decreased in both groups, although it was more evident in the group of manual therapy combined with home physical therapy, achieving a minimum clinical difference of 10 millimeters, compared with 4.4 millimeters in the home physical therapy group.

The study[32] that compared the application of botulinum toxin injections with myofascial manipulation showed that both groups had their pain eased. The group that received botulinum toxin had their pain eased to 5.2 in the post-injection assessment, while the group submitted to myofascial manipulation had it eased to 2.1 in the VAS, though with no statistical difference between the groups. The authors point out as a limitation that the VAS was not matched in the baseline – the participants of the group that received botulinum toxin had a higher level of pain. Moreover, this group had the injections applied only once, which may have compromised their results.

Barriere et al.[33] treated their patients with transverse massage and demonstrated that joint clicking decreased in 13% of the patients, the amplitude of mouth opening increased by 12.8%, and the pain disappeared in 51% of the cases after the massage. However, the study did not have a control group for comparison, the 15-participant sample was small, and it did not show the effect measure of their results; instead, they presented the variables only in relative frequency, making it impossible to identify their clinical significance.

Lastly, few articles assessed a protocol exclusively with manual therapy to treat TMD. Most of them used other combined interventions that also had significant effects, which made it difficult to interpret the effectiveness results of manual therapy alone. The main results were eased pain[29-34], improved mandibular mobility[29-34], and increased pressure pain threshold[32] and maximum mouth opening without pain[30].

The limitations of this study are the absence of a reverse search among the included articles, absence of analysis of the grey literature, and the important biases present in the methodology of the studies, such as the limited number of participants, rather heterogeneous samples regarding age groups, and the need for longer follow-up to verify the long-term effects.

CONCLUSION

The manual therapy techniques described by the literature to treat TMD in older adults were intra- and extraoral massage, TMJ and cervical spine mobilization, myofascial release, trigger-point finger pressure, and deep transverse massage. The studies observed clinical improvements in the amplitude of mandibular movements, masticatory function, and eased pain, reduced anxiety and joint noises, and increased amplitude of mouth opening without pain.

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