



## REVIEW ARTICLE

# Manual therapy in adults with tension-type headache: A systematic review<sup>☆</sup>

C. Cumplido-Trasmonte<sup>a</sup>, P. Fernández-González<sup>b,c,\*</sup>, I.M. Alguacil-Diego<sup>b,c</sup>,  
F. Molina-Rueda<sup>b,c</sup>

<sup>a</sup> Centro Ecobody, Fuenlabrada, Madrid, Spain

<sup>b</sup> Departamento de Fisioterapia, Terapia Ocupacional, Rehabilitación y Medicina Física, Facultad de Ciencias de la Salud, Universidad Rey Juan Carlos, Alcorcón, Madrid, Spain

<sup>c</sup> Laboratorio de Análisis del Movimiento, Biomecánica, Ergonomía y Control Motor (LAMBECOM), Universidad Rey Juan Carlos, Alcorcón, Madrid, Spain

Received 26 September 2017; accepted 1 December 2017

## KEYWORDS

Tension-type headache;  
Physiotherapy;  
Rehabilitation;  
Manual therapy;  
Treatment

## Abstract

**Introduction:** Tension-type headache is the most common primary headache, with a high prevalence and a considerable socioeconomic impact. Manual physical therapy techniques are widely used in the clinical field to treat the symptoms associated with tension-type headache. This systematic review aims to determine the effectiveness of manual and non-invasive therapies in the treatment of patients with tension-type headache.

**Development:** We conducted a systematic review of randomised controlled trials in the following databases: Brain, PubMed, Web of Science, PEDro, Scopus, CINAHL, and Science Direct. Ten randomised controlled trials were included for analysis. According to these studies, manual therapy improves symptoms, increasing patients' well-being and improving the outcome measures analysed.

**Conclusions:** Manual therapy has positive effects on pain intensity, pain frequency, disability, overall impact, quality of life, and craniocervical range of motion in adults with tension-type headache. None of the techniques was found to be superior to the others; combining different techniques seems to be the most effective approach.

© 2018 Sociedad Española de Neurología. Published by Elsevier España, S.L.U. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

<sup>☆</sup> Please cite this article as: Cumplido-Trasmonte C, Fernández-González P, Alguacil-Diego IM, Molina-Rueda F. Terapia manual en adultos con cefalea tensional: revisión sistemática. Neurología. 2021;36:537–547.

\* Corresponding author.

E-mail address: [pilar.fernandez@urjc.es](mailto:pilar.fernandez@urjc.es) (P. Fernández-González).

**PALABRAS CLAVE**

Cefalea tensional;  
Fisioterapia;  
Rehabilitación;  
Terapia manual;  
Tratamiento

**Terapia manual en adultos con cefalea tensional: revisión sistemática****Resumen**

**Introducción:** La cefalea tensional es la cefalea primaria más usual, con una prevalencia elevada y unas consecuencias socioeconómicas de gran impacto. Las técnicas de terapia manual, desde la fisioterapia, son muy utilizadas en el abordaje del conjunto de síntomas que puede provocar. El propósito fue realizar una revisión sistemática sobre la efectividad de las terapias manuales y no invasivas en el tratamiento de pacientes que presentan cefalea tensional en sus actuales formas.

**Desarrollo:** Se llevó a cabo una revisión sistemática de la literatura en busca de ensayos controlados y aleatorizados. Se emplearon las siguientes bases de datos: Brain, PubMed, Web of Science, PEDro, Scopus, CINHALL y Science Direct. Se analizaron 10 estudios, todos ellos ensayos controlados y aleatorizados. Según los estudios individuales, la intervención logra mejorar la clínica, aportando bienestar al paciente y mejorando las distintas medidas de resultado analizadas.

**Conclusiones:** La terapia manual logra efectos positivos sobre la intensidad y la frecuencia del dolor, la discapacidad, el impacto, la calidad de vida y el rango de movimiento craneocervical en adultos con cefalea tensional. No se encuentra superioridad entre una técnica con respecto a otra, siendo más efectivo el tratamiento combinado de estas.

© 2018 Sociedad Española de Neurología. Publicado por Elsevier España, S.L.U. Este es un artículo Open Access bajo la licencia CC BY-NC-ND (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

**Introduction**

Tension-type headache (TTH) is defined as oppressive, holocranial pain with few accompanying symptoms. TTH is the most prevalent primary headache.<sup>1</sup>

Episodic TTH (ETTH) may become chronic as a consequence of the central sensitisation caused by prolonged nociceptive stimulation in myofascial tissues.<sup>2–5</sup> Some authors believe that peripheral sensitisation is the main cause of ETTH, whereas chronic TTH (CTTH) may be caused by central sensitisation.<sup>5,6</sup>

The efficacy of manual therapy (MT) in TTH seems evident. Numerous studies have found it to be effective in reducing headache frequency, intensity, and duration, with a positive influence on quality of life, disability, and cervical range of motion.<sup>7–15</sup>

To date, several reviews have been conducted on the use of MT for TTH, the most recent dating from 2016<sup>6</sup>; however, the most recent study included in this review is from 2012. In another review from 2014, all trials included were published prior to 2011.<sup>16</sup> Some studies also include subjects with migraine and neck pain.<sup>17</sup> Another review published in 2015 only included studies comparing MT with pharmacological treatment; furthermore, it only considered pain intensity, frequency, and duration as outcome measures.<sup>18</sup> Another review, published in 2010, studied other pathological entities in addition to TTH, and therefore did not address in detail specific questions on this condition.<sup>19</sup> Finally, several reviews<sup>20,21</sup> have exclusively focused on MT with vertebral manipulation. Therefore, there is a need for an updated systematic review specifically addressing the effects of MT on TTH.

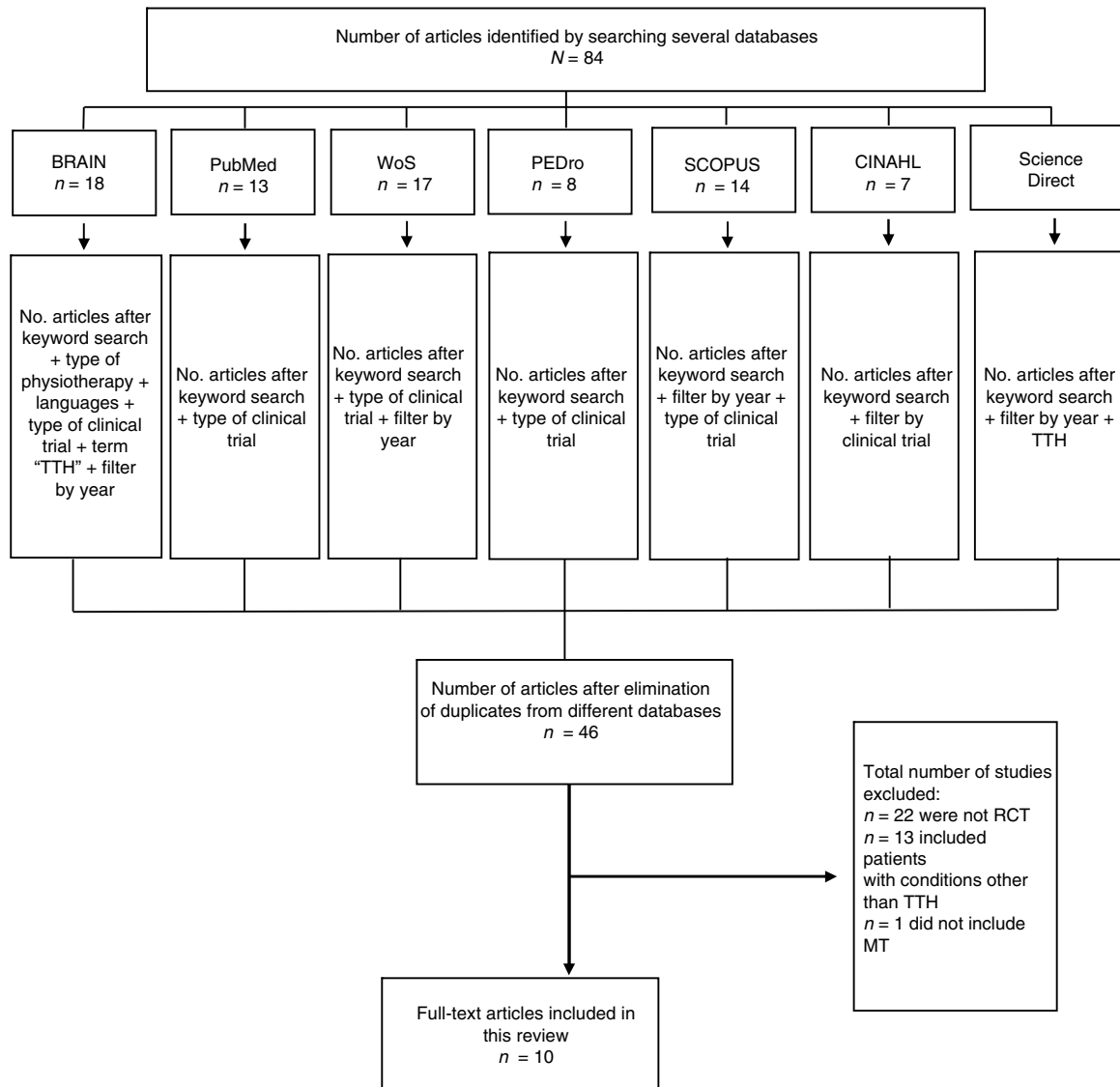
The aim of this systematic review is to assess the effectiveness of non-invasive MT in the treatment of patients with different types of TTH.

**Development****Inclusion and exclusion criteria**

We included studies meeting the following criteria: randomised clinical trials (RCT) including participants aged between 18 and 65 years and diagnosed with TTH according to the International Headache Society criteria.<sup>22,23</sup>

We searched for trials comparing interventions with joint mobilisations or physical therapy,<sup>8,14,24</sup> vertebral manipulation,<sup>9,10,12,13,25</sup> soft tissue techniques,<sup>8–10,12,13,15,24,25</sup> cranial techniques,<sup>26</sup> or neurodynamic techniques<sup>15</sup> to a control group. Regarding outcome measures, we included studies assessing any of the following variables with their main assessment instruments: pain frequency with a headache diary<sup>8,12–15</sup>; pain intensity with the visual analogue scale,<sup>8,12–15,26</sup> pressure algometry,<sup>8,15,24</sup> the Headache Index,<sup>24,26</sup> and the McGill Pain Questionnaire<sup>12</sup>; disability with the Headache Disability Index (HDI)<sup>8,10,13</sup>; quality of life with the Short Form-36 Health Survey<sup>14</sup> and the Short Form-12 Health Survey<sup>9,25</sup>; cervical range of motion with the Cervical Range of Motion Device<sup>8,12,13</sup> and goniometric measurements<sup>24</sup>; impact of headache on daily life with the Headache Impact Test (HIT-6)<sup>8,13,15</sup>; and such other outcome measures as presence of photophobia<sup>10</sup> or phonophobia,<sup>10</sup> self-perceived improvement,<sup>8</sup> and psychological aspects of pain (Multidimensional Headache Locus of Control).<sup>14</sup>

Exclusion criteria were as follows: (1) TTH was associated with some mechanical disorder, such as neck or shoulder pain; (2) patients with other types of headache (migraine, cervicogenic headache, etc.) were included; and (3) study assessed invasive physiotherapy and pharmacological treatment interventions.



**Figure 1** Flow chart showing the article selection process.

MT: manual therapy; RCT: randomised clinical trial; TTH: tension-type headache; WoS: Web of Science.

## Search strategy

The search was conducted from September to November 2016. We selected studies published in English or Spanish between 2000 and 2016. We searched the Brain, PubMed, Web of Science, PEDro, Scopus, CINAHL, and ScienceDirect databases, using the following search strategy: (1) "tension-type headache"; (2) "manual therapy"; and (3) "tension-type headache" AND "manual therapy."

## Review methodology

Studies were selected on the basis of the title and abstracts obtained in the electronic searches; full texts of potentially relevant studies were reviewed by 2 reviewers. After identifying the articles meeting our inclusion criteria, we assessed their methodological quality with the CASP guidelines<sup>27,28</sup> for clinical trials; the Oxford scale<sup>29</sup> was used to specify the

level of evidence and degree of recommendation. We used the PRISMA guidelines<sup>30</sup> to assess the quality of reviews.

## Results

### Description of studies

Of the 84 studies identified, we excluded 38 duplicate studies and 36 studies that did not meet the inclusion criteria (Fig. 1).<sup>2,17,31–41,16,42–62</sup> Data were extracted from 10 articles (Table 1):

- Five studies (240 participants) compared suboccipital soft tissue inhibition with articulatory technique and occiput–atlas–axis global manipulation, the combination of both techniques, and a control group.<sup>9,10,12,13,25</sup>

**Table 1** Summary of the study results.

Article	Type of intervention	Treatment duration	Outcome measures	Experimental protocol	Main results
Hanten et al. <sup>26</sup> (2000)	3 groups: G1: CV-4 G2: resting supine position G3: no treatment	One session for each group 10 min	Headache Index VAS	G1: $n=20$ ; G2: $n=20$ ; G3: $n=20$ (no characteristic differences between groups) Assessment after treatment (immediate effects) No drop-outs reported	No significant differences between groups at the end of treatment. G1 presented a greater improvement than G2 and G3 ( $P < .05$ ).
Demirturk et al. <sup>24</sup> (2002)	2 groups: G1: superficial heat, connective tissue manipulation G2: superficial heat, massage, and Cyriax's vertebral mobilisation	20 sessions, 4 weeks, 30 min	Headache diary including frequency, intensity, and HI Active CROM PPT	G1: $n=18$ ; G2: $n=17$ 100% women Assessment after treatment and at one month 5 explained drop-outs (both groups with $n=15$ )	Significant improvement in both groups ( $P < .01$ ) and in HI, CROM, and intensity ( $P > .05$ ). No significant differences between groups.
Van Etteken and Lucas <sup>14</sup> (2006)	2 groups: CG: conventional physiotherapy CTP: conventional physiotherapy with craniocervical training	Sessions: 20 min, 6 weeks	Headache diary VAS SF-36 MHLC Scale	CG: $n=42$ ; CT: $n=38$ Drop-out rate of 3.7% Assessment after treatment and at 6 months	At 6 weeks of follow-up, the CTP group showed a significant improvement in pain frequency ( $P = .0001$ ), intensity ( $P = .001$ ), and duration ( $P = .01$ ); and quality of life ( $P < .001$ ).
Castien et al. <sup>8</sup> (2011)	2 groups: MT: combination of mobilisations, exercises, and posture correction UC: usual care by general practitioner	9 sessions, 30 min	Headache diary VAS HDI HIT-6 CROM device Algometry Neck flexor muscle endurance Self-perceived improvement	MT: $n=41$ UC: $n=41$ No significant differences between groups Assessment at 8 and 26 weeks 7 participants were lost to follow-up (3 in the MT group and 4 in the UC group)	At 8 weeks: A 50% reduction in headache frequency was observed in 87.5% of patients in the MT group and 27.5% in the UC group. Favourable changes in the remaining variables in the MT group.  At 26 weeks: A 50% reduction in headache was observed in 81.6% of the patients in the MT group and 40.5% in the UC group. Smaller but still positive effects in the MT group.

Table 1 (Continued)

Article	Type of intervention	Treatment duration	Outcome measures	Experimental protocol	Main results
Espí-López and Gómez-Conesa <sup>12</sup> (2014)	4 groups: G1: manual therapy: suboccipital soft tissue inhibition G2: occiput–atlas–axis global manipulation G3: combination of 1 and 2 CG: no treatment	4 sessions, 20 min, 4 weeks	CROM device McGill Pain Questionnaire VAS Headache diary	G1: $n=20$ ; G2: $n=22$ ; G3: $n=20$ ; CG: $n=22$ Assessment after treatment and at one month. 4 drop-outs (2 in G2 and 2 in CG)	In the weekly record, G3 showed a significant improvement in frequency until the end of the study. Intensity was reduced in G2 and G3. Neck extension improved in G1 and G2, but improvements did not persist at one month of follow-up. Left lateral neck flexion notably improved in G2; the improvement persisted at one month of follow-up. All treatments improved left and right rotation; these improvements persisted at one month of follow-up in G1 and G2.
Espí-López et al. <sup>13</sup> (2014)	4 groups: G1: manual therapy: suboccipital soft tissue inhibition G2: occiput–atlas–axis global manipulation G3: combination of 1 and 2 CG: no treatment	4 sessions, 20 min, 4 weeks	HIT-6 HDI VAS CROM-device Headache diary	G1: $n=20$ ; G2: $n=22$ ; G3: $n=20$ ; CG: $n=22$ Assessment after treatment and at one month 4 drop-outs (2 in G2 and 2 in CG)	Short-term effects on HIT-6 scores in G2, and in all treatment groups at one month. G2 and G3 showed the greatest improvements in HDI score; all groups, including the CG, showed improvements during follow-up. ROM improved in all 4 groups, but improvements only persisted in the treatment groups. Frequency and intensity showed greater improvements in G2 and G3.
Espí-López et al. <sup>10</sup> (2014)	4 groups: G1: manual therapy: suboccipital soft tissue inhibition G2: occiput–atlas–axis global manipulation G3: combination of 1 and 2 CG: no treatment	4 sessions, 20 min, 4 weeks	HDI Photophobia Phonophobia Pericranial tension	G1: $n=19$ ; G2: $n=19$ ; G3: $n=19$ ; CG: $n=19$ Assessment after treatment and at one month No drop-outs reported	All 3 treatment groups showed significant differences on the emotional subscale; the greatest effect was observed in G3. G3 showed significant reductions in frequency of pericranial tension, photophobia, and phonophobia; the remaining groups did not show any of these improvements. In all items of the HDI, G3 showed greater improvements than G1 and CG. The best results on the functional scale were observed in G2. In terms of severity, G2 showed greater improvements than G1 and CG.

Table 1 (Continued)

Article	Type of intervention	Treatment duration	Outcome measures	Experimental protocol	Main results
Monzani et al. <sup>25</sup> (2016)	4 groups: G1: manual therapy: suboccipital soft tissue inhibition G2: occiput–atlas–axis global manipulation G3: combination of 1 and 2 CG: no treatment	4 sessions, 20 min, 4 weeks	4 items of the SF-12	G1: <i>n</i> = 20; G2: <i>n</i> = 20; G3: <i>n</i> = 20; CG: <i>n</i> = 20 Assessment after treatment and at one month No drop-outs reported	All treatments showed a great positive impact on the participants' quality of work life. Treatment with an inhibitory technique lead to higher reported quality of work life in participants with low frequency of work presenteeism; in contrast, manipulative treatment was more effective in improving the quality of work life when the frequency of work presenteeism was high or very high.
Espí-López et al. <sup>9</sup> (2016)	4 groups: G1: manual therapy: suboccipital soft tissue inhibition G2: occiput–atlas–axis global manipulation G3: combination of 1 and 2 CG: no treatment	4 sessions, 20 min, 4 weeks	SF-12	G1: <i>n</i> = 19; G2: <i>n</i> = 19; G3: <i>n</i> = 19; CG: <i>n</i> = 19 Assessment after treatment and at one month No drop-outs reported	No changes to quality of life were observed in any group but in G1, which showed a medium-sized effect during follow-up (0.51). All groups but CG showed improvements in bodily pain and social functioning. Vitality showed greater improvement in G3, with an effect size of 0.79. All treatment groups showed improvements in their emotional role. Mental health was significantly improved in G2 after treatment and in G2 and G3 at one month of follow-up. The frequency of feelings of discouragement and depression only improved in G3, in both assessments.
Ferragut-Garcías et al. <sup>15</sup> (2017)	4 groups: A: placebo superficial massage B: soft tissue techniques C: neurodynamics D: combination of B and C	6 sessions, 15 min, 4 weeks	PPT Headache diary VAS HIT-6	A: <i>n</i> = 25; B: <i>n</i> = 25; C: <i>n</i> = 25; D = 25 Assessment after treatment and at one month 3 unexplained drop-outs	Intensity and frequency notably improved in all groups but group A ( <i>P</i> < .001). Combined treatment (group D) showed the greatest effect. Group A showed lower values in all outcome measures ( <i>P</i> < .001). HIT-6: decrease of 13.1%, 13.5%, and 16.3% vs baseline in groups B, C, and D, respectively.

CG: control group; CROM: cervical range of movement; CV-4: compression of the fourth ventricle; G1: group 1; G2: group 2; G3: group 3; G4: group 4; HDI: Headache Disability Index; HI: Headache Index; HIT-6: Headache Impact Test; MHL: Multidimensional Headache Locus of Control; MT: manual therapy; PPT: pressure pain threshold; SF-12: Short Form-12 Health Survey; SF-36: Short Form-36 Health Survey; VAS: visual analogue scale.

- One study (97 participants) compared soft tissue techniques with neuromobilisations, a combination of both, and placebo superficial massage.<sup>15</sup>
- One study (35 participants) compared soft tissue techniques with Cyriax's vertebral mobilisation.<sup>24</sup>
- One study (81 participants) compared craniocervical flexion exercises with a latex band combined with conventional physiotherapy techniques including massage techniques with frictions; mobilisations based on the Maitland<sup>®</sup> method and cervical, dorsal, and lumbar-pelvic posture retraining; and a control group undergoing conventional physiotherapy.<sup>14</sup>
- One study (82 participants) compared MT techniques, exercises, and posture retraining to usual care by the general practitioner.<sup>8</sup>
- One study (60 participants) compared the resting supine position to the CV-4 technique and a control group.<sup>26</sup>

All studies included participants with TTH, 2 studies included adults with CTTH only,<sup>8,24</sup> and the remaining studies included both patients with CTTH and patients with ETTH.<sup>9,10,12–15,25,26</sup>

Intervention duration was 4 weeks in 7 studies,<sup>9,10,12,13,15,24,25</sup> more than 6 weeks in 2,<sup>8,14</sup> and only one session in one study.<sup>26</sup> Session duration ranged from 10 to 20 minutes in 8 studies,<sup>9,10,12–15,25,26</sup> and 30 minutes in 2 studies.<sup>8,24</sup>

A third assessment to observe long-term effects was only conducted in 3 studies.<sup>8,14,15</sup>

## Synthesis of results

The most widely used outcome measures in the studies reviewed were intensity<sup>8,12–15,26</sup> and frequency<sup>8,12–15</sup> of TTH. All trials used a headache self-report or diary and the visual analogue scale to measure these variables. Furthermore, several studies also used pressure algometry,<sup>8,15,24</sup> the Headache Index,<sup>24,26</sup> and the McGill Pain Questionnaire.<sup>12</sup> All the studies reported significant improvements after the intervention with regard to the control group. Combined therapy with different MT techniques had a larger effect.<sup>12,13,15</sup> A study based on a craniocervical exercise programme showed a significant, long-lasting reduction in frequency and intensity.<sup>14</sup>

Four studies analysed changes in craniocervical range of motion,<sup>8,12,13,24</sup> with 3 using the CROM device<sup>8,12,13</sup>; results were better in the groups treated with manipulation techniques.<sup>12,13</sup>

Three studies used the HDI. All treatment groups showed significant improvements in overall HDI scores. Total HDI score showed greater improvements with combined therapy of manipulation techniques plus suboccipital soft tissue inhibition in 2 studies.<sup>10,13</sup> In one study, improvements only persisted at 8 weeks in the group that received cervical manipulation.<sup>13</sup>

Three studies assessed participants' quality of life using the Short Form-36 Health Survey and its abbreviated version, the Short Form-12 Health Survey (Spanish-language version).<sup>63,64</sup> One of these focused on quality of life with regard to professional life,<sup>25</sup> using only 4 items from the Short Form-12 Health Survey. The greatest improvement

was observed in the group performing craniocervical exercises, posture retraining, and passive mobilisations based on the Maitland<sup>®</sup> method.<sup>14</sup> Quality of life in the professional domain improved especially in the group undergoing soft tissue techniques.

The HIT-6 was used in 3 trials, obtaining statistically significant improvements over baseline values.<sup>8,13,15</sup>

With regard to secondary outcome measures, one article analysed the presence of photophobia and phonophobia,<sup>10</sup> reporting improvements in the group receiving combined therapy of soft tissue inhibition plus cervical manipulation. Self-perceived improvement after treatment was assessed in one study; the MT group showed significant long- and short-term improvement.<sup>8</sup> One study<sup>14</sup> analysed the psychological aspects of pain using the Multidimensional Headache Locus of Control scale.<sup>65,66</sup>

## Methodological quality

We contacted Espí-López<sup>9,10,12,13,25</sup> and Oliva-Pascual-Vaca<sup>15</sup> to clarify some issues related to the blinding of therapists<sup>12,13</sup> and the participant selection process<sup>9,10,12,13</sup> in order to assess methodological quality. Only the first author provided the requested information.

All studies scored between 8 and 10 in the CASP guidelines (Table 2). The Oxford scale was used to assess both the level of evidence and the degree of recommendation. All studies were classified with a level of evidence 2B, with the exception of one, which was classified 1B.

Regarding drop-outs, 2 studies reported no drop-outs<sup>9,10</sup> and there were explained drop-outs in 3<sup>12,13,24</sup> and unexplained drop-outs in another 3 studies.<sup>8,14,15</sup> Finally, no mention was made of drop-outs in 2 studies.<sup>25,26</sup>

## Discussion

The aim of this systematic review was to assess the effectiveness of MT in patients with TTH by gathering and critically analysing RCTs.

All the studies analysed show positive results in patients receiving physiotherapy with MT. This review only includes patients diagnosed with TTH according to the International Headache Society criteria.

All but one<sup>24</sup> of the studies used an adequate sample size ( $\geq 60$  participants). However, methodological flaws were present in several studies, justifying cautious interpretation of the results. Firstly, only 3 trials were considered double-blind<sup>12,13,15</sup>; no blinding is mentioned or only participants were blinded in the remaining studies. Secondly, only one study<sup>8</sup> calculated confidence intervals to determine the precision of the effect on the clinical findings. Another important consideration was the similarity of the groups at the beginning of the study: 2 trials did not describe the groups,<sup>25,26</sup> which may have led to a confounding effect, for instance sex differences: some authors have found that women present a better response to physiotherapy than do men, and that patients with CTTH respond better than those with ETTH.<sup>67</sup>

In terms of outcome measures, most studies reported improved scores on the visual analogue scale.<sup>8,12–15,26</sup> All

**Table 2** CASP scale.

Study	(A) Are the results of the study valid?						(B) What were the results?		(C) Will the results help me in caring for my patients?			Total
	Clearly defined question	Random allocation	All patients considered	Blinding of patients, assessors, and clinicians	Similar groups at start of trial	Groups treated equally	Effect size	Precision of estimated effect	Applicability to the local population	Clinically relevant results	Justified risks/costs and benefit	
Hanten et al. <sup>26</sup> (2000)	1	1	1	0	1	1	1	0	1	1	1	9/11
Demirturk et al. <sup>24</sup> (2002)	1	1	1	0	0	1	1	0	1	1	1	8/11
Van Ettekoven and Lucas <sup>14</sup> (2006)	1	1	1	0	0	1	1	0	1	1	1	8/11
Castien et al. <sup>8</sup> (2011)	1	1	1	0	1	1	1	1	1	1	1	10/11
Espí-López and Gómez-Conesa <sup>12</sup> (2014)	1	1	1	1	1	1	1	0	1	1	1	10/11
Espí-López et al. <sup>13</sup> (2014)	1	1	1	0	1	1	1	0	1	1	1	9/11
Espí-López et al. <sup>10</sup> (2014)	1	1	1	1	1	1	1	0	1	1	1	10/11
Monzani et al. <sup>25</sup> (2016)	1	1	1	0	0	1	1	0	1	1	1	8/11
Espí-López et al. <sup>9</sup> (2016)	1	1	1	0	1	1	0	0	1	1	1	8/11
Ferragut-Garcías et al. <sup>15</sup> (2017)	1	1	1	1	1	1	1	0	1	1	1	10/11

0 = no; 1 = yes.



studies assessing headache frequency reported significant improvements. It should be noted that 3 studies analysing the disability caused by TTH showed significant improvements in the HDI, which has good psychometric properties in the study of headache.<sup>68,69</sup> The Spanish version of the tool<sup>70</sup> was used in one study.<sup>13</sup>

Quality of life improved significantly with treatments including a craniocervical exercise programme,<sup>14</sup> as reflected in changes in the Short Form-36 Health Survey score.<sup>71</sup> Significant improvements were also observed in the HIT-6 (which assesses the impact of headache on the patient's work or daily activities)<sup>72</sup> in the 3 studies that used it.<sup>8,13,15</sup>

We established the presence of photophobia and phonophobia as secondary outcome measures, given the importance of assessing these symptoms; however, only one study included them.<sup>12</sup>

After analysing the experimental protocols used in the studies, we can conclude that the dose of MT was very heterogeneous. Treatment duration in all studies ranged from 10 to 30 minutes for 4–6 weeks. Other systematic reviews recommend sessions of 30–45 minutes every 7–10 days.<sup>6</sup> In most of the studies, follow-up and assessment only consisted of a pre- and post-treatment examination; few studies included a third analysis.<sup>8,14,15</sup>

According to the findings of the studies reviewed, manipulation therapy might be more useful for gaining mobility in the neck, and improving disability indices and pain frequency. Soft tissue treatment achieved a greater improvement in the impact and intensity of pain. Most studies agreed that groups undergoing any combined therapy based on MT showed greater improvements than those receiving the different techniques separately.<sup>10,12,13,15</sup> Considering the information from the studies analysed, we believe that one effective treatment would consist of the combination of soft tissue techniques and structural techniques, in addition to craniocervical flexion exercises.

In line with previous reviews,<sup>6,16,18–21,48</sup> the studies analysed report that changes after MT are clinically significant. However, further studies of high methodological quality are needed to demonstrate the effectiveness of MT in improving quality of life and decreasing the disability caused by TTH.

This review presents several limitations. Some can be attributed to the samples used in some studies, since after contacting the lead author, we discovered that 2 studies included the same participants<sup>12,13</sup>; another 2 studies also used a single sample.<sup>9,10</sup> Furthermore, there may be studies published in other languages, which we have not included.

## Conclusions

Physiotherapy treatment based on MT achieves positive outcomes in pain intensity and frequency, disability, impact of headache, quality of life, and craniocervical range of motion in adults with TTH. Although the results show a clinical improvement, there is no clear evidence that any one technique is superior to another; the combination of both techniques is the most effective treatment.

## Conflicts of interest

The authors have no conflicts of interest to declare.

## References

1. Stovner LJ, Andree C. Prevalence of headache in Europe: a review for the Eurolight project. *J Headache Pain*. 2010;11:289–99.
2. Castien R, Blankenstein A, de Hertogh W. Pressure pain and isometric strength of neck flexors are related in chronic tension-type headache. *Pain Physician*. 2015;18:E201–5.
3. Lai TH, Protsenko E, Cheng YC, Loggia ML, Coppola G, Chen WT. Neural plasticity in common forms of chronic headaches. *Neural Plast*. 2015;2015:205985.
4. Fernández-de-las-Peñas C, Cuadrado ML, Arendt-Nielsen L, Simons DG, Pareja JA. Myofascial trigger points and sensitization: an updated pain model for tension-type headache. *Cephalalgia*. 2007;27:383–93.
5. Bendtsen L. Central sensitization in tension-type headache—possible pathophysiological mechanisms. *Cephalalgia*. 2000;20:486–508.
6. Lozano-López C, Mesa-Jiménez J, de-la-Hoz-Aizpurúa JL, Pareja-Grande J, Fernández-de-las-Peñas C. Efficacy of manual therapy in the treatment of tension-type headache. A systematic review from 2000–2013. *Neurologia*. 2016;31:357–69.
7. Espí-López GV, Gómez-Conesa A (dir). Eficacia del tratamiento de la cefalea tensional mediante terapia articular y de tejido blando suboccipital [tesis doctoral en Internet]. Murcia: Universidad de Murcia; 2010. Available from: <http://www.tdx.cat/bitstream/handle/10803/10872/EspiLopez.pdf> [accessed December 2016].
8. Castien RF, van der Windt DA, Grooten A, Dekker J. Effectiveness of manual therapy for chronic tension-type headache: a pragmatic, randomised, clinical trial. *Cephalalgia*. 2011;31:133–43.
9. Espí-López GV, Rodríguez-Blanco C, Oliva-Pascual-Vaca A, Molina-Martínez F, Falla D. Do manual therapy techniques have a positive effect on quality of life in people with tension-type headache? A randomized controlled trial. *Eur J Phys Rehabil Med*. 2016;52:447–56.
10. Espí-López GV, Rodríguez-Blanco C, Oliva-Pascual-Vaca A, Benítez-Martínez JC, Lluch E, Falla D. Effect of manual therapy techniques on headache disability in patients with tension-type headache. Randomized controlled trial. *Eur J Phys Rehabil Med*. 2014;50:641–7.
11. Espí-López GV, Arnal-Gómez A, Arbós-Berenguer T, González AA, Vicente-Herrero T. Effectiveness of physical therapy in patients with tension-type headache: literature review. *J Jpn Phys Ther Assoc*. 2014;17:31–8.
12. Espí-López GV, Gómez-Conesa A. Efficacy of manual and manipulative therapy in the perception of pain and cervical motion in patients with tension-type headache: a randomized, controlled clinical trial. *J Chiropr Med*. 2014;13:4–13.
13. Espí-López GV, Gómez-Conesa A, Gómez AA, Martínez JB, Pascual-Vaca AO, Blanco CR. Treatment of tension-type headache with articular and suboccipital soft tissue therapy: a double-blind, randomized, placebo-controlled clinical trial. *J Bodyw Mov Ther*. 2014;18:576–85.
14. Van Eetkoven H, Lucas C. Efficacy of physiotherapy including a craniocervical training programme for tension-type headache; a randomized clinical trial. *Cephalalgia*. 2006;26:983–91.
15. Ferragut-Garcías A, Plaza-Manzano G, Rodríguez-Blanco C, Velasco-Roldán O, Pecos-Martín D, Oliva-Pascual-Vaca J, et al. Effectiveness of a treatment involving soft tissue techniques and/or neural mobilization techniques in the management of

- the tension-type headache: a randomized controlled trial. *Arch Phys Med Rehabil.* 2017;98:211–9.
16. Chaibi A, Russell MB. Manual therapies for primary chronic headaches: a systematic review of randomized controlled trials. *J Headache Pain.* 2014;15:67.
  17. De Hertogh W, Vaes P, Devroey D, Louis P, Carpay H, Truijzen S, et al. Preliminary results, methodological considerations and recruitment difficulties of a randomised clinical trial comparing two treatment regimens for patients with headache and neck pain. *BMC Musculoskelet Disord.* 2009;10:115.
  18. Mesa-Jiménez J, Lozano-López C, Angulo-Díaz-Parreño S, Rodríguez-Fernández A, de-la-Hoz-Aizpurua J, Fernández-de-las-Peñas C. Multimodal manual therapy vs. pharmacological care for management of tension type headache: a meta-analysis of randomized trials. *Cephalalgia.* 2015;35:1323–32.
  19. Bronfort G, Haas M, Evans R, Leininger B, Triano J. Effectiveness of manual therapies: the UK evidence report. *Chiropr Osteopat.* 2010;18:3.
  20. Posadzki P, Ernst E. Spinal manipulations for tension-type headaches: a systematic review of randomized controlled trials. *Complement Ther Med.* 2012;20:232–9.
  21. Lenssinck ML, Damen L, Verhagen AP, Berger MY, Passchier J, Koes BW. The effectiveness of physiotherapy and manipulation in patients with tension-type headache: a systematic review. *Pain.* 2004;112:381–8.
  22. Headache Classification Committee of the International Headache Society. Classification and diagnostic criteria for headache disorders, cranial neuralgias and facial pain. *Cephalalgia.* 1988;8 Suppl. 7:1–96.
  23. Headache Classification Subcommittee of the International Headache Society. The International Classification of Headache Disorders: 2nd edition. *Cephalalgia.* 2004;24 Suppl. 1:9–160.
  24. Demirturk F, Akarcali I, Akbayrak T, Citak I, Inan L. Results of two different manual therapy techniques in chronic tension-type headache. *Pain Clinic.* 2002;14:121–8.
  25. Monzani L, Espí-López GV, Zurriaga R, Andersen LL. Manual therapy for tension-type headache related to quality of work life and work presenteeism: secondary analysis of a randomized controlled trial. *Complement Ther Med.* 2016;25:86–91.
  26. Hanten WP, Olson SL, Hodson JL, Imler VL, Knab VM, Magee JL. The effectiveness of CV-4 and resting position techniques on subjects with tension-type headaches. *J Manip Physiol Ther.* 2000;23:302–3.
  27. Guyatt GH, Sackett DL, Cook DJ. User's guides to the medical literature. II. How to use an article about therapy or prevention. *JAMA.* 1993;270:2598–601.
  28. Cabello JB. Plantilla para ayudarte a entender un ensayo clínico. In: CASPe. Guías CASPe de Lectura Crítica de la Literatura Médica. Cuaderno I. Alicante: CASPe; 2005. p. 5–8.
  29. Oxford Centre for Evidence-based Medicine. Levels of evidence (March 2009). Available from: <http://www.cebm.net/oxford-centre-evidence-based-medicine-levels-evidence-march-2009/> [accessed 02.10.16].
  30. Welch V, Petticrew M, Tugwell P, Moher D, O'Neill J, Waters E, et al. PRISMA-Equity 2012 extension: reporting guidelines for systematic reviews with a focus on health equity. *PLoS Med.* 2012;9:e1001333.
  31. Bodes-Pardo G, Pecos-Martín D, Gallego-Izquierdo T, Salom-Moreno J, Fernández-de-las-Peñas C, Ortega-Santiago R. Manual treatment for cervicogenic headache and active trigger point in the sternocleidomastoid muscle: a pilot randomized clinical trial. *J Manip Physiol Ther.* 2013;36:403–11.
  32. Borg-Stein J, Simons DG. Focused review: myofascial pain. *Arch Phys Med Rehabil.* 2002;83:540–7.
  33. Borusiak P, Biedermann H, Bosserhoff S, Opp J. Lack of efficacy of manual therapy in children and adolescents with suspected cervicogenic headache: results of a prospective, randomized, placebo-controlled, and blinded trial. *Headache.* 2010;50:224–30.
  34. Bracher ES, Almeida CI, Almeida RR, Duprat AC, Bracher CB. A combined approach for the treatment of cervical vertigo. *J Manip Physiol Ther.* 2000;23:96–100.
  35. Bronfort G, Assendelft WJ, Evans R, Haas M, Bouter L. Efficacy of spinal manipulation for chronic headache: a systematic review. *J Manip Physiol Ther.* 2001;24:457–66.
  36. Bryans R, Descarreaux M, Duranleau M, Marcoux H, Potter B, Ruegg R, et al. Evidence-based guidelines for the chiropractic treatment of adults with headache. *J Manip Physiol Ther.* 2011;34:274–89.
  37. Cagnie B, Danneels L, Cools A, Dickx N, Cambier D. The influence of breathing type, expiration and cervical posture on the performance of the cranio-cervical flexion test in healthy subjects. *Man Ther.* 2008;13:232–8.
  38. Castien R, Blankenstein A, van der Windt D, Heymans MW, Dekker J. The working mechanism of manual therapy in participants with chronic tension-type headache. *J Orthop Sports Phys Ther.* 2013;43:693–9.
  39. Castien RF, van der Windt DA, Dekker J, Mutsaers B, Grooten A. Effectiveness of manual therapy compared to usual care by the general practitioner for chronic tension-type headache: design of a randomised clinical trial. *BMC Musculoskelet Disord.* 2009;10:21.
  40. Castien RF, van der Windt DA, Blankenstein AH, Heymans MW, Dekker J. Clinical variables associated with recovery in patients with chronic tension-type headache after treatment with manual therapy. *Pain.* 2012;153:893–9.
  41. Castien RF, Blankenstein AH, Windt DA, Dekker J. Minimal clinically important change on the Headache Impact Test-6 questionnaire in patients with chronic tension-type headache. *Cephalalgia.* 2012;32:710–4.
  42. Chaibi A, Benth JS, Russell MB. Validation of placebo in a manual therapy randomized controlled trial. *Sci Rep.* 2015;5:11774.
  43. Conidi FX. Interventional treatment for post-traumatic headache. *Curr Pain Headache Rep.* 2016;20:40.
  44. De Hertogh WJ, Vaes PH, Devroey D, Truijzen S, Duquet W, Oostendorp R. Management of headache disorders: design of a randomised clinical trial screening for prognostic patient characteristics. *BMC Musculoskelet Disord.* 2007;8:38.
  45. Fernández-de-las-Peñas C, Alonso-Blanco C, San-Román J, Miangolarra-Page JC. Methodological quality of randomized controlled trials of spinal manipulation and mobilization in tension-type headache, migraine, and cervicogenic headache. *J Orthop Sports Phys Ther.* 2006;3:160–9.
  46. Fernández-de-las-Peñas C, Alonso-Blanco C, Cuadrado ML, Pareja JA. Myofascial trigger points in the suboccipital muscles in episodic tension-type headache. *Man Ther.* 2006;11:225–30.
  47. Fernández-de-las-Peñas C, Cuadrado ML. Therapeutic options for cervicogenic headache. *Expert Rev Neurother.* 2014;14:39–49.
  48. Fernández-de-las-Peñas C, Alonso-Blanco C, Cuadrado ML, Miangolarra JC, Barriga FJ, Pareja JA. Are manual therapies effective in reducing pain from tension-type headache? A systematic review. *Clin J Pain.* 2006;22:278–85.
  49. Fernández-de-las-Peñas C. Physical therapy and exercise in headache. *Cephalalgia.* 2008;28 Suppl. 1:36–8.
  50. Freitag F. Managing and treating tension-type headache. *Med Clin North Am.* 2013;97:281–92.
  51. Hall T, Chan HT, Christensen L, Odenthal B, Wells C, Robinson K. Efficacy of a C1–C2 self-sustained natural apophyseal glide (SNAG) in the management of cervicogenic headache. *J Orthop Sports Phys Ther.* 2007;37:100–7.
  52. Michael G. Tension-type headache or sinister masquerader? *J Osteopath Med.* 2002;5:31–4.

53. Nilsson N, Bove G. Evidence that tension-type headache and cervicogenic headache are distinct disorders. *J Manip Physiol Ther.* 2000;23:288–9.
54. Oliveira-Campelo NM, Rubens-Rebelatto J, Martin-Vallejo FJ, Albuquerque-Sendí F, Fernández-de-las-Peñas C. The immediate effects of atlanto-occipital joint manipulation and suboccipital muscle inhibition technique on active mouth opening and pressure pain sensitivity over latent myofascial trigger points in the masticatory muscles. *J Orthop Sports Phys Ther.* 2010;40:310–7.
55. Olivo SA, Macedo LG, Gadotti IC, Fuentes J, Stanton T, Magee DJ. Scales to assess the quality of randomized controlled trials: a systematic review. *Phys Ther.* 2008;88:156–75.
56. River Y, Levital T, Belgrade M. Computerized mobilization of the cervical spine for the treatment of chronic neck pain. *Clin J Pain.* 2012;28:790–6.
57. Rodríguez-Fuentes I, de Toro FJ, Rodríguez-Fuentes G, de Oliveira I, Mejjide-Faílde R, Fuentes-Boquete IM. Myofascial release therapy in the treatment of occupational mechanical neck pain: a randomized parallel group study. *Am J Phys Med Rehabil.* 2016;95:507–15.
58. Sun-Edelstein C, Mausekopp A. Complementary and alternative approaches to the treatment of tension-type headache. *Curr Pain Headache Rep.* 2012;16:539–44.
59. Toro-Velasco C, Arroyo-Morales M, Fernández-de-las-Peñas C, Cleland JA, Barrero-Hernández FJ. Short-term effects of manual therapy on heart rate variability, mood state, and pressure pain sensitivity in patients with chronic tension-type headache: a pilot study. *J Manip Physiol Ther.* 2009;32:527–35.
60. Vavrek D, Haas M, Peterson D. Physical examination and self-reported pain outcomes from a randomized trial on chronic cervicogenic headache. *J Manip Physiol Ther.* 2010;33:338–48.
61. Vernon H, Jansz G, Goldsmith CH, McDermaid C. A randomized, placebo-controlled clinical trial of chiropractic and medical prophylactic treatment of adults with tension-type headache: results from a stopped trial. *J Manip Physiol Ther.* 2009;32:344–51.
62. Zito G, Jull G, Story I. Clinical tests of musculoskeletal dysfunction in the diagnosis of cervicogenic headache. *Man Ther.* 2006;11:118–29.
63. Alonso J, Prieto L, Anto JM. La versión española del SF-36 Health Survey (Cuestionario de Salud SF-36): un instrumento para la medida de los resultados clínicos. *Med Clin (Barc).* 1995;104:771–6.
64. Monteagudo PO, Hernando L, Palomar JA. Reference values of the Spanish version of the SF-12v2 for the diabetic population. *Gac Sanit.* 2009;23:526–32.
65. Martin NJ, Holroyd KA, Rokicki LA. The Headache Self-Efficacy Scale: adaptation to recurrent headaches. *Headache.* 1993;33:244–8.
66. Martin NJ, Holroyd KA, Penzier DB. The Headache-Specific Locus of Control Scale: adaptation to recurrent headaches. *Headache.* 1990;30:729–34.
67. Torelli P, Jensen R, Olesen J. Physiotherapy for tension-type headache: a controlled study. *Cephalgia.* 2004;24:29–36.
68. Jacobson GP, Ramadan NM, Norris L, Newman CW. Headache Disability Inventory (HDI): short-term test–retest reliability and spouse perceptions. *Headache.* 1995;35:534–9.
69. Jacobson GP, Ramadan NM, Aggarwal SK, Newman CW. The Henry Ford Hospital Headache Disability Inventory (HDI). *Neurology.* 1994;44:837–42.
70. Rodríguez-Franco L, Cano-García FJ, Blanco-Picabia A. Conductas de dolor y discapacidad en migrañas y cefaleas tensionales. Adaptación española del Pain Behavior Questionnaire (PBQ) y del Headache Disability Inventory (HDI). *Anal Modif Conducta.* 2000;26:739–62.
71. Van der Zee KI, Sanderma R, Heyink J. Psychometric quality of the MOS 36-item Short-Form Health Survey (SF-36) in a Dutch population. *Tijdschr Soc Gezondheidszorg.* 1993;7:183–91.
72. Ware JE Jr, Bjorner JB, Kosinski M. Practical implications of item response theory and computerized adaptive testing: a brief summary of ongoing studies of widely used headache impact scales. *Med Care.* 2000;38 Suppl.:II73–82.