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Research

Exercise, especially combined stretching and strengthening exercise, reduces myofascial pain: a systematic review

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KEY WORDS

Systematic review
Exercise
Myofascial pain
Disability
Physical therapy

ABSTRACT

Question: Among people with myofascial pain, does exercise reduce the intensity of the pain and disability? **Design:** Systematic review of randomised and quasi-randomised controlled trials. **Participants:** People with myofascial pain of any duration. **Intervention:** Exercise versus minimal or no intervention and exercise versus other intervention. **Outcome measures:** Pain intensity and disability. **Results:** Eight studies involving 255 participants were included. Pooled estimates from six studies showed statistically significant effects of exercise when compared with minimal or no intervention (support and encouragement or no treatment) on pain intensity at short-term follow-up. The weighted mean difference in pain intensity due to exercise was –1.2 points (95% CI –2.3 to –0.1) on a 0 to 10 scale. Pooled estimates from two studies showed a non-significant effect of exercise when compared with other interventions (electrotherapy or dry needling) on pain intensity at short-term follow-up. The weighted mean difference in pain intensity due to exercise instead of other therapies was 0.4 points (95% CI –0.3 to 1.1) on a 0 to 10 scale. Individual studies reported no significant effects of exercise on disability compared with minimal intervention (–0.4, 95% CI –1.3 to 0.5) and other interventions (0.0, 95% CI –0.8 to 0.8) at short-term follow-up. Sensitivity analysis suggested that combining stretching and strengthening achieves greater short-term effects on pain intensity compared with minimal or no intervention (–2.3, 95% CI –4.1 to –0.5). **Conclusion:** Evidence from a limited number of trials indicates that exercise has positive small-to-moderate effects on pain intensity at short-term follow-up in people with myofascial pain. A combination of stretching and strengthening exercises seems to achieve greater effects. These estimates may change with future high-quality studies. **[Mata Diz JB, de Souza JRLM, Leopoldino AAO, Oliveira VC (2016) Exercise, especially combined stretching and strengthening exercise, reduces myofascial pain: a systematic review. *Journal of Physiotherapy* 63: 17–22]**

Introduction

Myofascial pain is a musculoskeletal condition characterised by the presence of muscle pain from myofascial trigger points.[1] A trigger point is a sensitive region associated with a taut band of muscle that is painful during compression or stretching, producing referred pattern pain and autonomic symptoms.[1,2]

An epidemiological study conducted in a rural community in Thailand reported a point prevalence of 6.3% for myofascial pain.[3] Another study found a point prevalence of 30% for myofascial pain in primary care patients who sought treatment due to pain.[4] A potential explanation for large differences in prevalence estimates is that previous studies may have investigated secondary myofascial pain associated with specific conditions such as fibromyalgia and osteoarthritis.[1,5] The diagnosis of myofascial pain as a primary event is difficult and usually conducted by exclusion of associated conditions.[1] Primary and secondary myofascial pain are musculoskeletal problems that cause persistent disability and productivity loss worldwide.[5,6]

In clinical practice, the pain and disability related to myofascial pain is sometimes treated with approaches such as massage, acupuncture and electro-thermotherapy;[7–9] however, the effectiveness of many of these approaches is unclear. For instance, there is no significant evidence that ultrasound or superficial dry needling is more effective than placebo.[8,9] Exercise may be an option to reduce the pain intensity and disability that are related to myofascial pain. Exercise – including various types of stretching, strengthening and endurance training – is non-invasive, non-pharmacological and low cost. It may be used as the first treatment option for pain relief, reduction of protective muscle spasm, and improvement in range of motion and function in many musculoskeletal conditions.[10–12] Exercise typically has few or no side effects in people with myofascial pain.[8,12]

The effectiveness of exercise in myofascial pain remains unclear. Four identified systematic reviews in the field[8,10,13,14] have reported the effects of exercise on myofascial pain, but the evidence is limited in several ways. These reviews did not have appropriate designs to investigate the effectiveness of exercise

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alone in primary myofascial pain specifically.[8,10,13,14] Furthermore, some of the reviews did not investigate whether the effects are clinically important.[13,14] Besides, exercise was usually investigated in multimodal approaches, which limited assessment of its specific effects.[8]

Therefore, in an attempt to address this gap, the research question for this systematic review of randomised and quasi-randomised controlled trials was:

Among people with myofascial pain, does exercise reduce the intensity of the pain and disability?

Method

The protocol of this review was registered at PROSPERO (CRD42015024642).[15]

Identification and selection of studies

Electronic searches from the earliest record to March 2015 were conducted on Medline, AMED, CENTRAL, EMBASE and PEDro, without language restriction. Searches were updated in August 2016. In addition, hand searching was conducted in the reference lists of all eligible studies and previous systematic reviews. The English terms used into the search strategy were related to *randomised controlled trial, exercise* and *myofascial pain*. The full search strategy is presented in Appendix 1 (see eAddenda).

After removing duplicates, potential titles and abstracts were selected. Later, two independent reviewers (JRLMS and VCO) assessed potential full-texts and those studies fulfilling the eligibility criteria were included in the review (Box 1). Reviewers' disagreements were resolved by consensus. Studies investigating myofascial pain during pregnancy and associated with other conditions such as acute musculoskeletal trauma, fibromyalgia, osteoarthritis and neurological disorders were excluded.

Assessment of characteristics of studies

Quality

Two independent reviewers (JBMD and AOL) assessed the methodological quality of the included studies using the PEDro scale.[16] This scale rates whether a study meets each of 11 criteria, 10 of which (those related to risk of bias and completeness of reporting) are summed to create a score from 0 to 10. This assessment tool has been previously validated and it is commonly used to rate clinical trials in systematic reviews.[16,17] Reviewers had previous training and a third reviewer (VCO) resolved any disagreements.

Box 1. Inclusion criteria.

Design
- Randomised or quasi-randomised controlled trials

Participants
- People diagnosed with myofascial pain of any duration as their primary condition

Intervention
- Exercise

Outcome measures
- Pain intensity
- Disability

Comparisons
- Exercise versus minimal or no intervention (eg, behavioural instructions or no treatment, sham/placebo)
- Exercise versus other intervention (eg, massage, taping, dry needling, electrotherapy)

Source

Prospective randomised or quasi-randomised controlled trials that involved inpatients, outpatients or people living in the community, and recruited from any primary, secondary or tertiary care settings, were eligible for inclusion in this review. Characteristics of participants, settings and duration of symptoms were extracted when available.

Participants

Studies were eligible if they included participants with myofascial pain according to definition of the International Association for the Study of Pain (IASP): a painful condition that affects the musculoskeletal system characterised by the presence of trigger points.[18] The myofascial pain of the participants could be of any duration. The extracted data about the participants at baseline included sample size, gender and age.

Intervention

The experimental intervention was exercise, which was defined as a planned, structured and repetitive physical activity in order to improve or maintain physical fitness elements.[19] This definition of exercise included all types of stretching, strengthening and endurance training, and postural exercises.[11,19] Exercise had to be a stand-alone intervention. Studies were excluded if exercise was combined with other interventions. For experimental group(s) (ie, exercise or other intervention), extracted data included type of exercise, weekly frequency and total duration of treatment.

Outcome measures

The outcome measures were pain intensity and disability. After baseline, outcome data were extracted for short-term, medium-term and long-term effects. Short-term effects were categorised as follow-up $\leq$ 3 months after baseline; medium-term effects as follow-up $>$ 3 months and $<$ 12 months after baseline; and long-term effects as follow-up $\geq$ 12 months after baseline. If more than one time point were available within the same follow-up period, the one closer to the end of the intervention for any of the follow-up periods was considered.

Data analysis

One reviewer (JBMD) extracted the above-listed data using a standardised form. A second reviewer (VCO) double-checked the extracted data and disagreements were resolved by discussion. Measures of central tendency (eg, mean and median) and variability (eg, standard deviation and interquartile range) were extracted for short-term, medium-term and long-term effects. Data were transformed to a common scale from 0 to 10. Meta-analyses were conducted according to between-study heterogeneity, which was assessed using I^2 statistics.[20] $I^2 < 50\%$ was categorised as low heterogeneity and $I^2 \geq 50\%$ as moderate-to-high heterogeneity. Pooled effects were estimated using weighted mean differences with 95% confidence intervals (CI), where negative values favoured exercise. A fixed-effect model was used to conduct meta-analysis when I^2 was $< 50\%$, while a random-effects model was used to conduct meta-analysis when I^2 was $\geq 50\%$. To judge the clinical relevance of changes provided by exercise (ie, differences between exercise and minimal/no intervention or other intervention), two points on a 0-to-10 scale for pain intensity[9,21] and disability[22,23] was considered a clinically worthwhile between-group difference. Sensitivity analysis was carried out to investigate the impact of type of exercise on effect estimates. Meta-analyses were performed using commercial software[a].

The Grading of Recommendations Assessment, Development and Evaluation (GRADE) system was used to summarise the overall quality of evidence for each outcome. The GRADE system ranges from high quality to very low quality.[24] For the purposes of this review, the rating of evidence started at moderate on the GRADE system, because publication bias could not be assessed due to the

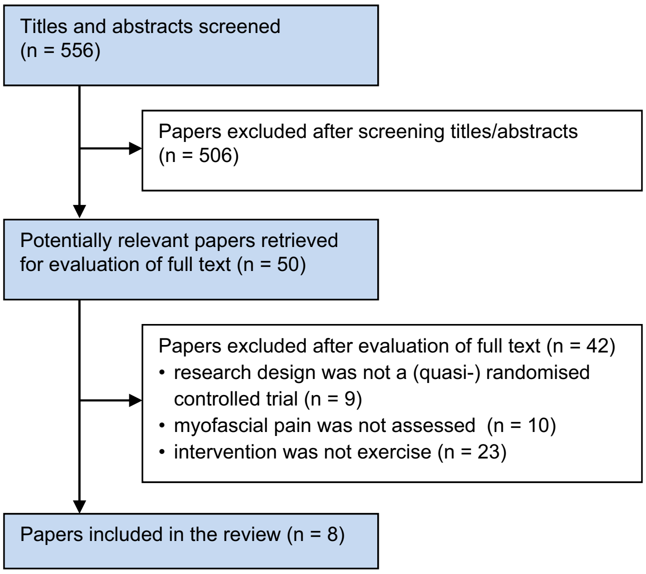

Figure 1. Flow of studies through the review.

small number of included studies (< 10 studies).[25] For both outcomes, the GRADE rating was downgraded by one level if one of the following pre-specified criteria were present: low methodological quality (average PEDro score < 5); inconsistency of estimates within or between studies ($I^2 \geq 50\%$); indirectness of participants (eg, myofascial pain identified only by self-reported methods); imprecision (pooling < 300 participants for each outcome).[26] Two reviewers (JBMD and AOL) independently assessed the quality of the evidence using GRADE system and a third reviewer (VCO) resolved potential disagreements.

Results

Flow of studies through the review

The searches initially retrieved 822 papers. After removing duplicates, the titles and abstracts of 556 papers were screened. Of these, 506 papers were excluded and 50 potentially eligible full texts were assessed. Hand searching did not detect additional studies. Ultimately, eight original studies were included.[27–34] Figure 1 presents the flow of studies through the review.

Description of studies

All included studies were randomised, controlled trials published in English between the years 1988 and 2016. The characteristics of the included studies are presented in Table 1.

Quality

The methodological quality of the included studies is presented in Table 2. Mean methodological quality of the included studies was 6.8 on the PEDro scale. All of the included studies achieved randomisation, outcome measures for > 85% of participants, intention-to-treat analysis, between-group comparisons, and reporting of precision/variability measures. Baseline comparability was achieved in 75% (n = 6) of the studies, whereas the assessor-blinding criterion was achieved in 50% (n = 4) of the studies. The main methodological quality issues were related to concealed allocation and therapist blinding criteria, presented by 38%

Table 1
Characteristics of the included studies.

Study	Eligibility and source	Participants	Intervention	Outcome measures
Acar et al (2012)[27]	Patients with MP within the last 6 months, aged ≤ 65 years	n = 40 Age (*yr*) = 37 (SD 11)	Exp = stretching + strengthening; 5/wk x 2 wk (n = 20) Con = no treatment (n = 20)	Pain = VAS *(0 to 10)* Follow-up = 2 weeks
Burgess et al (1988)[28]	Patients with MP divided in two groups: pain duration less or greater than 6 months, selected from a specialised clinical care service	n = 19 Age (*yr*) = 34 (SD N/A)	Exp = reflex muscle relaxation; 5/wk x 3 wk (n = 11) Con = no treatment = instructions for painless maintenance of jaw (n = 8)	Pain = PRI-MPQ *(0 to 20)* Follow-up = 3 weeks
Buttagat et al (2016)[29]	Patients with MP for at least 3 months, aged 18 to 40 years, recruited from a community setting	n = 36 Age (*yr*) = 21 (SD 1	Exp = stretching + strengthening; 3/wk x 4 wk (n = 18) Con = no treatment (n = 18)	Pain = VAS *(0 to 10)* Follow-up = 4 and 6 weeks
Cho et al (2012)[30]	Patients with MP diagnosed by an orthopaedist, recruited from a general hospital care service	n = 24 Age (*yr*) = 48 (SD 12)	Exp = stretching + strengthening; 3/wk x 4 wk (n = 12) Oth = extracorporeal shock wave therapy; 3/wk x 4 wk (n = 12)	Pain = VAS *(0 to 10)* Disability = NDI *(0 to 50)* Follow-up = 4 weeks
Edwards et al (2003)[31]	Patients with MP for at least 10 months, referred for physiotherapy through general practitioners	n = 26 Age (*yr*) = 56 (SD 16)	Exp = stretching; frequency according to condition severity x 6 wk (n = 13) Con = no treatment (n = 13)	Pain = SFMPQ *(0 to 60)* Follow-up = 3 and 6 weeks
Gavish et al (2006)[32]	Patients with MP for at least 6 months, aged 20 to 45 years, recruited prospectively from a specialised clinical care service	n = 20 Age (*yr*) = 27 (SD 8)	Exp = chewing exercises; 5/wk x 8 wk (n = 10) Con = minimal intervention = support and encouragement (n = 10)	Pain [a] = VAS *(0 to 100)* Disability = DS *(0 to 100)* Follow-up = 8 weeks
Lari et al (2016)[33]	Patients with latent myofascial trigger points, aged 18 to 30 years, recruited from a public university	n = 40 Age (*yr*) = 25 (SD 4)	Exp = contract-relax stretching; 3/wk x 1 wk (n = 20) Oth = dry needling; 3/wk x 1 wk (n = 20)	Pain = VAS *(0 to 10)* Follow-up = 1 week
Trampas et al (2010)[34]	Physically active volunteers with at least one latent myofascial trigger point, aged 19 to 24 years, recruited from a public university	n = 20 Age (*yr*) = 21 (SD 1)	Exp = contract-relax PNF stretching; 1/wk x 1 wk (n = 10) Con = no treatment (n = 10)	Pain = VAS *(0 to 10)* Follow-up = 0, 10 and 30 minutes post-treatment

Con = control group, DS = disability score, Exp = experimental group, MP = myofascial pain, N/A = not available, NDI = neck disability index, Oth = other active intervention, PNF = proprioceptive neuromuscular facilitation, PRI-MPQ = pain rating index-McGill pain questionnaire, SFMPQ = short-form McGill pain questionnaire; VAS = visual analogue scale.

[a] Pain at the moment of examination.

Table 2
Methodological quality of the included studies using PEDro scale (n = 8).

Study	Random allocation	Concealed allocation	Groups similar at baseline	Participant blinding	Therapist blinding	Assessor blinding	< 15% dropouts	Intention-to-treat analysis	Between-group difference reported	Point estimate and variability reported	Total (0 to 10)
Acar et al (2012)[27]	Y	N	N	N	N	N	Y	Y	Y	Y	5
Burgess et al (1988)[28]	Y	N	Y	N	N	N	Y	Y	Y	Y	6
Buttagat et al (2016)[29]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Cho et al (2012)[30]	Y	N	N	N	N	N	Y	Y	Y	Y	5
Edwards et al (2003)[31]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Gavish et al (2006)[32]	Y	N	Y	N	N	Y	Y	Y	Y	Y	7
Lari et al (2016)[33]	Y	N	Y	N	N	N	Y	Y	Y	Y	6
Trampas et al (2010)[34]	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	9

N = no, Y = yes.

(n = 3)[29,31,34] and 12% (n = 1)[34] of the studies, respectively. None of the included studies met the participant-blinding criterion.

Participants

The eight original studies enrolled 255 participants of both genders, with mean ages ranging from 21 (SD 1) to 56 (SD 16) years old. The main musculoskeletal regions affected by myofascial pain were the neck,[27,28,30,33] shoulder,[29,30] orofacial[28,32] and appendicular skeleton.[34] One study[31] did not define specific regions affected by myofascial pain. Four studies (50%) reported symptom duration of > 3 months,[27,29,31,32] one study (12%) divided symptom duration into ≤ or > than 6 months[28] and three studies (38%) did not indicate the symptom duration.[30,33,34]

Intervention

Six studies[27,28,30,31,33,34] reported two experimental groups performing exercise; only data from the group that performed exercise alone were eligible. Six studies[27–29,31,32,34] compared exercise to minimal or no intervention (ie, support and encouragement or no treatment), and two studies[30,33] compared exercise with other intervention (ie, electrotherapy or dry needling). Frequency of exercise programmes ranged from one to five times per week and their total duration ranged from 1 to 8 weeks.

Outcome measures

Three studies[28,31,32] investigating pain intensity and the two[30,32] investigating disability had their measures transformed to a common 0 to 10 scale using a standardised way in all transformations. For one study[32] that investigated pain intensity at different times, the data for pain intensity at the time of examination were used in the review in order to be consistent with other included studies. All studies reported short-term effects only (ie, ≤ 3 months after the baseline). The data extracted from each study are presented in Appendix 2 (see eAddenda).

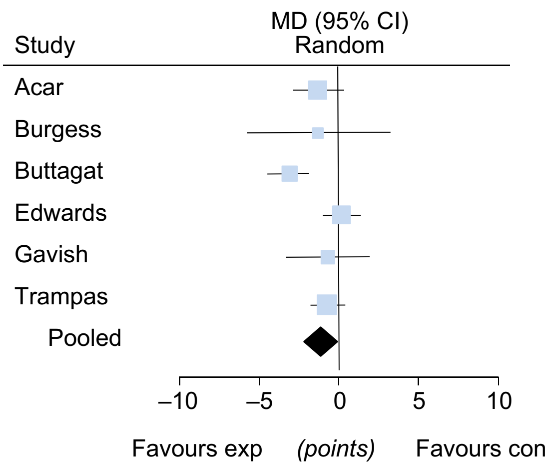

Figure 2. Weighted mean difference (95% CI) comparing exercise versus minimal or no intervention on pain intensity (range 0 to 10), estimated by pooling data from six studies (n = 161).

Effect of intervention

Exercise versus minimal or no intervention

The pooled estimate from six studies[27–29,31,32,34] including 161 participants showed a significant effect of exercise on pain intensity at short-term follow-up compared with minimal or no intervention (ie, support and encouragement or no treatment). The weighted mean difference was –1.2 (95% CI –2.3 to –0.1) points on a scale from 0 to 10 (see Figure 2, or Figure 3 on the eAddenda for a detailed forest plot). The effect size provided by exercise on pain intensity was not considered to be clinically worthwhile.[9,21] The evidence, which was very low quality, indicated that exercise provides a small-to-moderate effect on pain intensity at short-term follow-up compared with minimal or no intervention. The quality of evidence was downgraded two levels (ie, from moderate to very low quality) because of inconsistency among studies ($I^2 \geq 50\%$) and imprecision (pooling < 300 participants).

Only one study[32] including 20 participants compared exercise with minimal intervention (ie, support and encouragement) on disability and found a mean difference of –0.4 (95% CI –1.3 to 0.5, $p > 0.05$) points on a 0 to 10 scale at short-term follow-up. This study was plotted on a forest plot to facilitate readers' understanding (see Figure 4a). The evidence, which was very low quality, indicated that exercise has a non-significant effect on disability at short-term follow-up compared with minimal intervention. The quality of evidence was downgraded two levels (ie, from moderate to very low quality) because there was inconsistency ($I^2 \geq 50\%$) and imprecision (pooling < 300 participants).

Exercise versus other intervention

The pooled estimate from two studies[30,33] including 64 participants showed a non-significant effect of exercise on pain intensity at short-term follow-up compared with other intervention (ie, electrotherapy or dry needling). The weighted mean difference was 0.4 (95% CI –0.3 to 1.1) points on a 0 to 10 scale (see Figure 5, or Figure 6 on the eAddenda for a detailed forest plot). The evidence, which was low quality, indicated that exercise has a non-significant effect on pain intensity at short-term follow-up

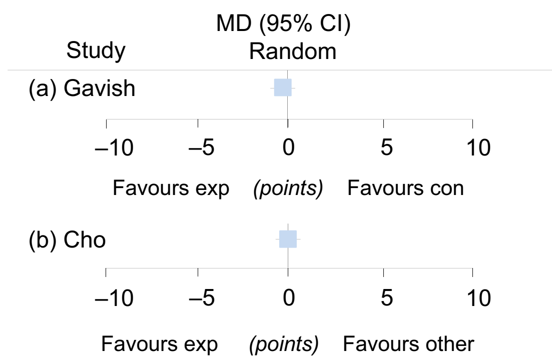

Figure 4. Weighted mean difference (95% CI) in illustrative plot comparing exercise versus (a) a minimal-intervention control and (b) other intervention on disability (range 0 to 10). Plotted data are from one study for each comparison (n = 20 and n = 24, respectively).

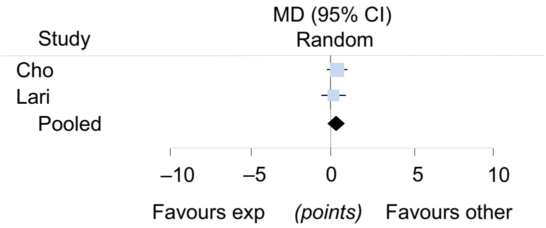

Figure 5. Weighted mean difference (95% CI) comparing exercise versus other intervention on pain intensity (range 0 to 10), estimated by pooling data from two studies (n = 64).

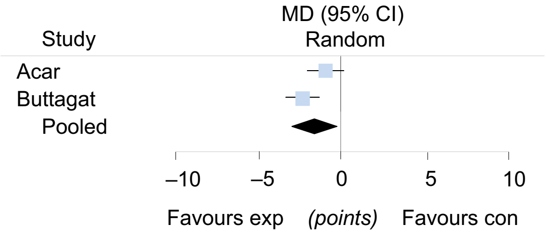

Figure 7. Weighted mean difference (95% CI) in sensitivity analysis comparing exercise versus no intervention on pain intensity (range 0 to 10), estimated by pooling data from two studies combining stretching and strengthening exercises (n = 76).

compared with other intervention. The quality of evidence was downgraded one level (ie, from moderate to low) because of imprecision (pooling $<$ 300 participants).

Only one study[30] including 24 participants compared exercise with another intervention (ie, electrotherapy) on disability and found a mean difference of 0.0 (95% CI –0.8 to 0.8, $p > 0.05$) points on a 0 to 10 scale at short-term follow-up. This study was plotted on a forest plot to facilitate readers' understanding (see Figure 4b). The evidence, which was very low quality, indicated that exercise has a non-significant effect on disability at short-term follow-up compared to extracorporeal shock wave therapy. The quality of evidence was downgraded from moderate to very low quality because there was inconsistency ($I^2 \geq 50\%$) and imprecision (pooling $<$ 300 participants).

Sensitivity analysis

The impact of exercise type on effect estimates was investigated with sensitivity analysis. Due to the small number of studies investigating disability and comparing exercise with other interventions, sensitivity analysis was only performed for studies investigating pain intensity and comparing exercise with minimal or no intervention. Only two studies[27,29] including 76 participants used a combination of stretching and strengthening as the exercise intervention. Sensitivity analysis found that this combination achieved greater effects on pain intensity. Weighted mean difference was –2.3 (95% CI –4.1 to –0.5) points on a 0 to 10 scale (see Figure 7, or Figure 8 on the eAddenda for a detailed forest plot).

Discussion

This review aimed to estimate the effects of exercise on pain intensity and disability related to myofascial pain. Pooled estimates were obtained from six studies comparing exercise versus minimal or no intervention (ie, support and encouragement or no treatment) and two studies comparing exercise versus other intervention (ie, electrotherapy or dry needling) on pain intensity at short-term follow-up. The pooled results showed very low quality evidence that exercise significantly reduces pain intensity compared with minimal or no intervention. Although the mean between-group difference was lower than the nominated clinically worthwhile difference, the confidence interval still included the possibility that the true effect of exercise might be clinically worthwhile.

Even though the pooled result from the available evidence does not confirm that the effect of exercise on pain is clinically worthwhile for myofascial pain at the moment, clinicians may still consider this approach due to: its statistically (and possibly clinically) significant benefit; its low cost and safety, presenting low or no risks of injury for patients, including those with myofascial pain;[8,10,35] and its anticipated other benefits that have been demonstrated in general populations, such as those observed on body weight, bone density and quality of life.[36] None of the included studies in this review reported harmful effects, and the other benefits of exercise included improvements in cardiorespiratory fitness, mood, sleep and quality of life.[10,11,35,36] These benefits may also be protective factors against several diseases.[35,36] In order to achieve greater effects on myofascial pain, a possible solution is to combine exercise with other interventions such as laser and manual therapy.[37] There is strong evidence showing individual clinically important short-term effects of these interventions on pain intensity when compared with placebo or another intervention for myofascial pain (ie, change of two points on a 0 to 10 scale).[38,39]

Another solution to ensure the clinical worth of exercise in myofascial pain may be to combine stretching and strengthening exercises. The sensitivity analysis in this review suggested that this combination achieves greater short-term effects than other types of exercise. Stretching and strengthening exercises improve blood flow and energy metabolism in muscles as well as reorganise muscle fibre cytoarchitecture.[40,41] These physiological changes explain how exercise can reduce myofascial pain symptoms.[40] The combination of stretching and strengthening pooled in the sensitivity analysis involved sessions of three to five times per week for a total period of no more than 4 weeks, with or without supervision.[27,29] The specific effects of other types of exercise on myofascial pain and disability were unable to be estimated with meta-analysis because there were not enough studies.

This was the first systematic review of randomised and quasi-randomised controlled trials investigating the effects of exercise alone in primary myofascial pain. While the search strategy was comprehensive, focused strictly on myofascial pain, and followed by a careful selection of studies, potential limitations for this review need to be addressed. First, diagnosis of myofascial pain is not always clear; a gold standard is unavailable at the moment and identification of taut bands and trigger points requires certain expertise among the examiners. To minimise this limitation in the review, myofascial pain was targeted as a primary condition, excluding other clinical manifestations (eg, fibromyalgia) commonly observed in patients with myofascial pain; this approach has also been used elsewhere in the literature.[1] Second, although the results showed favourable effects of exercise at short-term follow-up, effect estimates should be interpreted with caution and taking into account the small sample size and heterogeneity among included studies. Third, none of the included studies reported participant blinding and only one study reported therapist blinding. These methodological issues might influence the effects, because of participants' and therapists' preferences and beliefs.

In conclusion, there is very low quality evidence at the moment that exercise has positive small-to-moderate effects on pain intensity at short-term follow-up in people with myofascial pain. A combination of stretching and strengthening exercises seems to achieve greater effects. These estimates may change with future high-quality studies. Future studies should also investigate the effects of exercise on other clinical outcomes such as quality of life, medication consumption and adverse events.

What is already known on this topic: Exercise is a non-invasive and non-pharmacological approach that has been broadly indicated to treat pain and disability related to musculoskeletal conditions. Existing systematic reviews have not isolated the effect of exercise in primary myofascial pain specifically.
What this study adds: Exercise improves pain in the short term in people with myofascial pain. The overall effect of exercise may or may not be clinically worthwhile, but combined stretching and strengthening exercise specifically has a stronger effect on pain that is more likely to be considered clinically worthwhile by people with myofascial pain.

Footnotes: [a]Comprehensive Meta-Analysis 2.2.04, Biostat, Englewood, USA.

eAddenda: Figures 3, 6 and 8 and Appendices 1 and 2 can be found online at doi:10.1016/j.jphys.2016.11.008

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References

1. Gerwin RD. Classification, epidemiology, and natural history of myofascial pain syndrome. *Curr Pain Headache Rep.* 2001;5:412–420.
2. Zhuang X, Tan S, Huang Q. Understanding of myofascial trigger points. *Chin Med J.* 2014;127:4271–4277.
3. Chaiamnuay P, Darmawan J, Muirden KD, Assawatanabodee P. Epidemiology of rheumatic disease in rural Thailand: a WHO-ILAR COPCORD study. Community Oriented Programme for the Control of Rheumatic Disease. *J Rheumatol.* 1998;25:1382–1387.
4. Skootsky SA, Jaeger B, Oye RK. Prevalence of myofascial pain in general internal medicine practice. *West J Med.* 1989;151:157–160.
5. Fleckenstein J, Zaps D, Ruger LJ, Lehmeyer L, Freiberg F, Lang PM, et al. Discrepancy between prevalence and perceived effectiveness of treatment methods in myofascial pain syndrome: results of a cross-sectional, nationwide survey. *BMC Musculoskelet Disord.* 2010;11:32.
6. Rollman GB, Lautenbacher S. Sex differences in musculoskeletal pain. *Clin J Pain.* 2001;17:20–24.
7. Dommerholt J, Grieve R, Layton M, Hooks T. An evidence-informed review of the current myofascial pain literature. *J Bodyw Mov Ther.* 2015;19:126–137.
8. Rickards LD. The effectiveness of non-invasive treatments for active myofascial trigger point pain: a systematic review of the literature. *Int J Osteopath Med.* 2006;9:120–136.
9. Kietrys DM, Palombaro KM, Azzaretto E, Hubler R, Schaller B, Schlussel JM, et al. Effectiveness of dry needling for upper-quarter myofascial pain: a systematic review and meta-analysis. *J Orthop Sports Phys Ther.* 2013;43:620–634.
10. Smidt N, de Vet HC, Bouter LM, Dekker J, Arendzen JH, de Bie RA, et al. Effectiveness of exercise therapy: a best-evidence summary of systematic reviews. *Aust J Physiother.* 2005;51:71–85.
11. Jansen MJ, Viechtbauer W, Lenssen AF, Hendriks EJ, de Bie RA. Strength training alone, exercise therapy alone, and exercise therapy with passive manual mobilisation each reduce pain and disability in people with knee osteoarthritis: a systematic review. *J Physiother.* 2011;57:11–20.
12. Moraes AR, Sanches ML, Ribeiro EC, Guimaraes AS. Therapeutic exercises for the control of temporomandibular disorders. *Dental Press J Orthod.* 2013;18:134–139.
13. Leaver AM, Refshauge KM, Maher CG, McAuley JH. Conservative interventions provide short-term relief for non-specific neck pain: a systematic review. *J Physiother.* 2010;56:73–85.
14. Nunes AMP, Moita JPA. Effectiveness of physical and rehabilitation techniques in reducing pain in chronic trapezius myalgia: a systematic review and meta-analysis. *Int J Osteopath Med.* 2015;18:189–206.
15. Diz JB, Souza JRL, Leopoldino AA, Oliveira VC. Exercise effectiveness in myofascial pain: a systematic review. 2015. Available from: http://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42015024642. [accessed 25/08/2016].
16. Maher CG, Sherrington C, Herbert RD, Moseley AM, Elkins M. Reliability of the PEDro scale for rating quality of randomized controlled trials. *Phys Ther.* 2003;83:713–721.
17. Shiwa SR, Costa LO, Moser AD, Aguiar IC, Oliveira LV. PEDro: the physiotherapy evidence database [in Portuguese]. *Fisioter Mov.* 2011;24:523–533.
18. Kim M, Lee M, Kim Y, Oh S, Lee D, Yoon B. Myofascial pain syndrome in the elderly and self-exercise: a single-blind, randomized, controlled trial. *J Altern Complement Med.* 2016;22:244–251.
19. Caspersen CJ, Powell KE, Christenson GM. Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public Health Rep.* 1985;100:126–131.
20. Higgins JP, Green S, editors. *Cochrane handbook for systematic reviews of interventions, Version 5.1.0* [update March 2011]. The Cochrane Collaboration; 2011. Available from: http://handbook.cochrane.org/. [accessed 03/08/2016].
21. Farrar JT, Young Jr JP, LaMoreaux L, Werth JL, Poole RM. Clinical importance of changes in chronic pain intensity measured on an 11-point numerical pain rating scale. *Pain.* 2001;94:149–158.
22. Cleland JA, Childs JD, Whitman JM. Psychometric properties of the Neck Disability Index and Numeric Pain Rating Scale in patients with mechanical neck pain. *Arch Phys Med Rehabil.* 2008;89:69–74.
23. Soer R, Koke AJ, Vroomen PC, Stegeman P, Smeets RJ, Coppes MH, et al. Extensive validation of the pain disability index in 3 groups of patients with musculoskeletal pain. *Spine.* 2013;38:E562–E568.
24. Balshem H, Helfand M, Schunemann HJ, Oxman AD, Kunz R, Brozek J, et al. GRADE guidelines: 3. Rating the quality of evidence. *J Clin Epidemiol.* 2011;64:401–406.
25. Ioannidis JP, Trikalinos TA. The appropriateness of asymmetry tests for publication bias in meta-analyses: a large survey. *CMAJ.* 2007;176:1091–1096.
26. Henschke N, Ostelo RW, van Tulder MW, Vlaeyen JW, Morley S, Assendelft WJ, et al. Behavioural treatment for chronic low-back pain. *Cochrane Database Syst Rev.* 2010;7:CD002014.
27. Acar B, Yilmaz OT. Effects of different physiotherapy applications on pain and mobility of connective tissue in patients with myofascial pain syndrome. *J Back Musculoskelet Rehabil.* 2012;25:261–267.
28. Burgess JA, Sommers EE, Truelove EL, Dworkin SF. Short-term effect of two therapeutic methods on myofascial pain and dysfunction of the masticatory system. *J Prosthet Dent.* 1988;60:606–610.
29. Buttagat V, Taepa N, Suwannived N, Rattanachan N. Effects of scapular stabilization exercise on pain related parameters in patients with scapulocostal syndrome: a randomized controlled trial. *J Bodyw Mov Ther.* 2016;20:115–122.
30. Cho Y-S, Park S-J, Jang S-H, Choi Y-C, Lee J-H, Kim J-S. Effects of the combined treatment of extracorporeal shock wave therapy (ESWT) and stabilization exercises on pain and functions of patients with myofascial pain syndrome. *J Phys Ther Sci.* 2012;24:1319–1323.
31. Edwards J, Knowles N. Superficial dry needling and active stretching in the treatment of myofascial pain–a randomised controlled trial. *Acupunct Med.* 2003;21:80–86.
32. Gavish A, Winocur E, Astandzelov-Nachmias T, Gazit E. Effect of controlled masticatory exercise on pain and muscle performance in myofascial pain patients: a pilot study. *Cranio.* 2006;24:184–190.
33. Lari AY, Okhovatian F, Naimi S, Baghban AA. The effect of the combination of dry needling and MET on latent trigger point upper trapezius in females. *Man Ther.* 2016;21:204–209.
34. Trampas A, Kitsios A, Sykaras E, Symeonidis S, Lazarou L. Clinical massage and modified Proprioceptive Neuromuscular Facilitation stretching in males with latent myofascial trigger points. *Phys Ther Sport.* 2010;11:91–98.
35. Pedersen BK, Saltin B. Evidence for prescribing exercise as therapy in chronic disease. *Scand J Med Sci Sports.* 2006;16(Suppl 1):3–63.
36. Garber CE, Blissmer B, Deschenes MR, Franklin BA, Lamonte MJ, Lee IM, et al. American College of Sports Medicine position stand. Quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: guidance for prescribing exercise. *Med Sci Sports Exerc.* 2011;43:1334–1359.
37. Vernon H, Schneider M. Chiropractic management of myofascial trigger points and myofascial pain syndrome: a systematic review of the literature. *J Manipulative Physiol Ther.* 2009;32:14–24.
38. Chow RT, Johnson MI, Lopes-Martins RA, Bjordal JM. Efficacy of low-level laser therapy in the management of neck pain: a systematic review and meta-analysis of randomised placebo or active-treatment controlled trials. *Lancet.* 2009;374(9705):1897–1908.
39. Vernon H, Humphreys BK. Chronic mechanical neck pain in adults treated by manual therapy: a systematic review of change scores in randomized controlled trials of a single session. *J Man Manip Ther.* 2008;16:E42–E52.
40. Jafri MS. Mechanisms of myofascial pain. *Int Sch Res Notices.* 2014;2014.
41. Majlesi J, Unalan H. Effect of treatment on trigger points. *Curr Pain Headache Rep.* 2010;14:353–360.