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Literature Review

Effectiveness of stretching exercise versus kinesiotaping in improving length of the pectoralis minor: A systematic review and network meta-analysis

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ABSTRACT

Objective: Shortness of the pectoralis minor (PM) is a potential mechanism underlying shoulder impingement syndrome. Few studies have examined the effects of kinesiotaping and stretching exercise on PM length or index. This systematic review and network meta-analysis investigated the effects of stretching exercise and kinesiotaping on PM length and index in adults.

Methods: This study followed Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Randomised controlled trials including adults with or without symptomatic shoulders were included. Heterogeneity between studies was assessed using I2 statistics, and publication bias was evaluated by constructing a funnel plot.

Results: We extracted data from six randomised controlled trials that included 263 participants (age range: 18–50 years). Compared with usual care, kinesiotaping resulted in greater improvement in PM length (mean difference, 1.15 cm; 95% confidence interval [CI]: 0.20–2.10 cm). Compared with usual care and kinesiotaping, proprioceptive neuromuscular facilitation (PNF) stretching increased PMI significantly, with a mean difference of 1.40 (95% CI: 1.17–1.63) and 1.08 (95% CI: 0.29–1.87) cm, respectively.

Conclusion: Compared with no intervention, kinesiotaping is beneficial for lengthening the PM. Intervention with static stretching alone has no effect on PM length. Compared with kinesiotaping alone and no intervention, PNF stretching increases PMI.

1. Introduction

The pectoralis minor (PM), the muscle arising from the third, fourth, and fifth ribs and inserting into the coracoid process of the scapula, functions to increase scapular posterior tipping and decrease scapular internal rotation during arm elevation (Borstad & Ludewig, 2005; Muraki et al., 2009). Maintaining a forward shoulder posture and performing repetitive scapular movements involving anterior tilting and protraction of the scapula can result in adaptive shortness of the PM. This shortness is a potential mechanism underlying neck and shoulder pain syndrome (Morais & Cruz, 2016; Roland, 1986; Rosa, Borstad, Pogetti, & Camargo, 2017). Thus, PM stretching and relaxing can be a treatment strategy for symptomatic patients with shoulder disorders.

The corner stretch is a frequently used exercise believed to slow the progression of PM shortness (Morais & Cruz, 2016; Mostafavifar, Wertz, & Borchers, 2012; Rosa et al., 2017). In their systematic review on stretching techniques for the PM, Morais and Cruz suggested that the efficacy of stretching techniques is determined by the force and duration applied (Morais & Cruz, 2016). In addition, the efficacy of stretching techniques may vary depending on the symptomatic condition of the patients (Medicine, 2013; Morais & Cruz, 2016; Mostafavifar et al., 2012). The efficacy of stretching related to techniques selection/dosage and patient's condition remains under debate.

Scapular kinesiotaping is suggested as an alternative technique to relax or relieve PM tightness with forward shoulder posture

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(Han, Lee, & Yoon, 2015). Kinesiotaping is a therapy involving the use of elastic cotton strips with an acrylic adhesive that may be stretched to up to 140% of their original length (Yasukawa, Patel, & Sisung, 2006). Kinesiotaping is believed to improve the cutaneous stimulation of sensorimotor and proprioceptive systems during muscle contraction and is used to treat various neuromuscular disorders (Simoneau, Degner, Kramper, & Kittleson, 1997). A review of two publications identified 97 patients with impingement syndrome and showed that kinesiotaping has a short-term effect on ROM, rest pain, night pain and movement pain (Mostafavifar et al., 2012). In this systematic review and meta-analysis, we compared the efficacy of stretching and kinesiotaping in improving the PM length and its relation to symptoms.

2. Materials and methods

2.1. Identification of studies

We searched MEDLINE, EMBASE, the Cochrane Central Register of Controlled Trials (CENTRAL), and the Physiotherapy Evidence Database (PEDro) using keywords such as PM, stretching exercise, kinesiotaping, and other related terms. The search was done in English with no limit on the year of publication (up to January 2019). The detailed search strategy is freely accessible in the protocol (PROSPERO ID: CRD42018089951).

2.2. Selection of sample studies

Systematic reviews and meta-analyses were conducted according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) guidelines, and a predetermined protocol was employed. We included only randomized control trials that involved comparison between the interventions of stretching exercise, kinesiotaping and the usual-care control group in adults (age $\geq$ 18). In addition, the inclusion criteria specified that at least one of two data results, namely, PM length and pectoralis minor index (PMI), must be included. The usual-care control group was compared with the kinesiotaping group and stretching exercise. The usual-care control group received no treatment with relevant active interventions included strengthening ROM, stretching exercise or taping. Trials incorporating a placebo-based intervention (e.g., education) or sham treatment were included.

The intervention protocols of stretching exercise are classified in accordance with the American College of Sports Medicine (ACSM) (Medicine, 2013). Several types of stretching, such as static stretching (SS), dynamic stretching (DS) and proprioceptive neuromuscular facilitation (PNF), target the PM. We selected all types of stretching to complete our review.

2.3. Data extraction and bias assessment

PM length was categorized as the primary outcome, while PMI

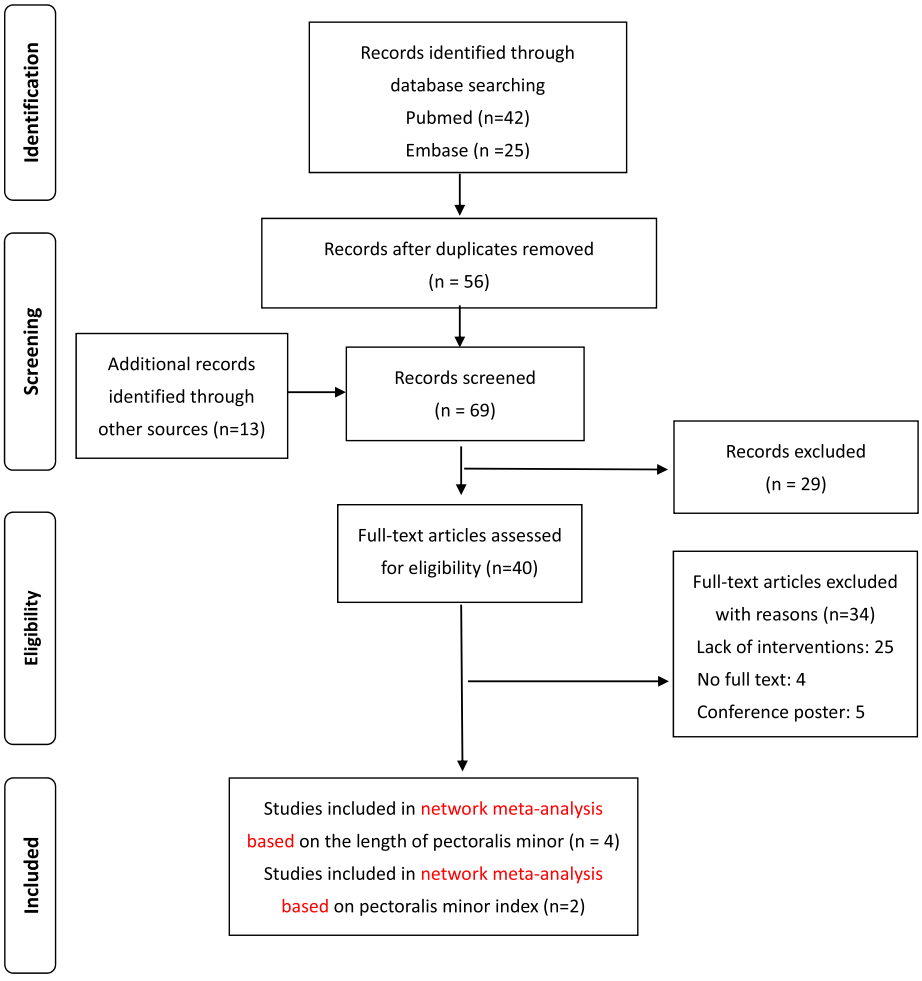


Fig. 1. Flowchart of network meta-analysis.

Table 1
Review based on the stretching exercise and kinesiotaping in network meta-analysis.

Author, year	Participant characteristics	Interventions	Types of stretching	Outcome measures	Main results
Ozer et al., 2018 (meta-analysis)	n = 72 elite asymptomatic overhead athletes (basketball, handball, or volleyball) Age: 17.0 ± 4.1 Height: 175.0 ± 11 [a] (4 groups: rigid taping, kinesio taping, placebo, or control)	Kinesiotaping: (1) Y-strip of supraspinatus (2) I-strip from the coracoid process around the posterior deltoid (3) Y-strip from the T10–T12 area to the medial border of the scapula Rigid Taping: (1) from the anterior aspect of the shoulder to the T6 area (2) from just below the coracoid in the anterior aspect of the shoulder to the T10 area	Nil	PMI Scapular dyskinesis Scapular upward rotation	PMI: increased immediately and at 60 −72 h after taping in the rigid taping ($P < 0.001$) and kinesiotaping ($P < 0.001$) * Scapular dyskinesis: percentages decreased immediately after taping in the rigid taping ($p = 0.002$) and kinesiotaping ($p = 0.008$)* Scapular upward rotation: no differences within or between groups
Laudner et al., 2015 (meta-analysis)	n = 39, 39f, swimmers METs group: Age: 19.6 ± 1.2 Height: 170.7 ± 6.3 Control group: Age: 19.6 ± 1.0 Height: 169.9 ± 6.4	METs: the treatment arm was passively moved into horizontal abduction, in line with the PM and sternal fibers of the pectoralis major muscle fibers, until the end range of motion was reached. The arm was held at this barrier for 3 s. The shoulder was then brought out of the stretch slightly, and the participant was instructed to "pull against the investigator's resistance towards the opposite hip." This contraction was performed isometrically with approximately 25% of the participant's maximal effort for 5 s. Frequency: Four cycles, 2 sessions/week, 6-week period	PNF stretch	PMI Forward scapular position Scapular upward rotation in positions of rest and 60, 90, and 120 degree of humeral elevation.	PMI ($p = 0.001$)* Forward scapular position ($p = 0.001$)*
Viriyatharakij et al., 2017 (meta-analysis)	n = 60; 49f, 11 m, healthy, right-hand-dominant Intervention group: Age: 24.2 ± 8.1 Height: 161.1 ± 76.9 Control group: Age: 24.0 ± 7.0 Height: 162.6 ± 9.4 Drop-outs: 0	Intervention: PM stretching by active scapular retraction Control: participants were asked to sit in upright position Staying position for 20s, resting for 10s Frequency: each exercise 3 sets, total of 90s	Static stretch	PM length Acromial distance: sitting position. The perpendicular distance was calculated from posterior aspect of acromion process to the wall	PM length ($p < 0.05$)* Intervention: +2.5 mm Control: +1.2 Acromial distance ($p < 0.05$)* Intervention:-0.62 Control: −0.04
Han et al., 2015 (meta-analysis)	n = 14; 14 m Rounded shoulder posture, worked for at least 7 h/d, 5 d/week, in a seated position Age: 24.6 ± 0.9 Height:172.6 ± 6.0 Drop-outs: 0	Two groups: kinesiotaping: from the anterior aspect of the acromion to the spinous process of the 10th thoracic vertebra was applied with approximately 35–40% stretch	Nil	PM length Acromial distance: supine position. The perpendicular distance was calculated from posterior aspect of acromion process to the bed Total scapular distance: distance from the inferior angle of the acromion to the spinous process of the third thoracic vertebrae	PM length, Acromial distance, total scapular distance ($p < 0.05$)* Taping stretch: PM and total scapular distance of dominant and non-dominant sides increased significantly ($p < 0.05$), acromial distance of dominant and non-dominant sides decreased significantly ($p < 0.05$) Placebo stretch: PM and total scapular distance of dominant and non-dominant sides did not show a significant increase ($p > 0.05$), acromial distance of dominant and non-dominant sides did not decreased significantly ($p > 0.05$)
Rosa et al., 2017 (meta-analysis)	n = 50; 27f, 23 m, Participants present with shortened PM length (PMI<9.93) Shoulder pain group: present with at least 1 week of symptoms consistent with SIS Duration of pain: 42.3 ± 64.5 months Age: 30.0 ± 5.8 Height: 169 ± 7 Healthy group Age: 25.8 ± 7.0 Height: 169 ± 8 Drop-outs: 27 (pain during stretching)	Both groups performed a daily PM self-stretching protocol for 6 weeks. Stretching protocol: 90 degree of arm abduction, 90 degree of elbow flexion, and the palmar surface of the hand on the wall. The contralateral leg to the shoulder being stretched was positioned forward of the other leg. To apply the stretch, the trunk is shifted forward and rotated opposite to the side being stretched. Frequency: 4 rcps of 1 min stretch with 30 s rest period	Static stretch	DASH score PM length (rest) PM length (retraction)	DASH score: shoulder pain group showed statistically significance decreasing ($p = 0.001$) Rest and retraction PM length showed no statistically significance in both groups
William et al., 2013 (meta-analysis)	n = 29; 25f, 4 m, 50 shoulders for final data analysis. Healthy swimming	Focused stretching protocol: Participants in a supine position with the investigator's fingers to be fixed posterior to the proximal end of PM. The investigator then applied	Static stretch	PM length Scapular kinematic measurement (upward/downward rotation,	PM length: gross stretch > control shoulder ($P = 0.007$)* No statistically significant differences for all three scapular kinematic variables

(*continued on next page*)

Table 1 (*continued*)

Author, year	Participant characteristics	Interventions	Types of stretching	Outcome measures	Main results
	athletes Age: 19.5 ± 1.2 Height: 171.7 ± 5.7 Drop-outs: 0	pressure in the anterior direction, similar to attempting to lift the muscle, thereby applying tensile force directly to the pectoralis minor. The opposite hand of the investigator was used to stabilize the scapula and humeral head. Gross stretching protocol: Participants were positioned in the supine position with the test arm ABD and ER to 90° and the elbow flexed to 90°. The investigator stabilized each subject's body by placing a hand on the contralateral coracoid. The investigator then passively, horizontally ABD the participants' shoulder. Frequency: two sequential rcps, holding the stretches for 30 s, with a 30 s break between each stretch.		external/internal rotation, anterior/posterior rotation)	were found among any of the three groups (P > 0.08).

*Significant improvement in favor of the intervention group as reported by the authors.
ABD, abducted; DASH, Disabilities of the Arm, Shoulder and Hand; ER, external rotated; f, female; METs, muscle-energy techniques; m, male; s, second; PNF, proprioceptive neuromuscular facilitation; SIS, shoulder impingement syndrome; PM, pectoralis minor; PMI, pectoralis minor index; rcps, repetition.
[a] Results of kinesiotaping group and control group were extracted in network meta-analysis.

was a secondary outcome. The resting muscle length was measured from the caudal edges of the 4th rib to the inferior medial aspect of the coracoid process with a measuring tape (Borstad & Ludewig, 2005). The PMI was calculated by dividing the resting muscle length measurement by the subject's height and multiplying by 100 (Struyf et al., 2014).

A standardized data extraction form was used. Study population characteristics (number of subjects, mean and standard deviation of age and proportion of gender), intervention and control methods, details of interventions (stretching protocols and taping details) and outcome measures (PM length or PMI) were extracted. The drop-out rates of the studies and the drop-out reasons were ascertained. If the outcome was measured at multiple time points, the last post-intervention outcome was adopted. The first author was contacted to request further information if the trial did not provide the effect sizes of the outcomes. The data were extracted from full-text articles by the same independent extractor. The publication bias was assessed virtually with funnel plots of effect size (weighted mean difference) against its standard error. Egger's test was used for quantitative assessment of asymmetry. The risk of potential bias assessments was conducted with Cochrane Collaboration's tool (Higgins et al., 2011). Printed forms were used in the assessment process. This study was not funded or sponsored by any special interest.

2.4. Data synthesis and analysis

The effect size was represented as the mean change from baseline in PM length (cm) and PMI. All the outcomes were continuous variables. Because the use of different protocols raised concerns about heterogeneity, the data of PM length were polled with a random effects model of the network meta-analysis along with the weighted mean difference with 95% confidential intervals (CI). The data of PMI were polled with fixed effects model of the network meta-analysis. Change in standard deviation was calculated using the following formula:

2.5. Change in standard deviation

$$\text{Change in standard deviation } (SD) = \sqrt{SD_{pre}{}^2 + SD_{post}^2 - 2 \times Corr(pre,\ post) \times SD_{pre} \times SD_{post}}$$

Within-participant correlation was imputed to be 0.5 if correlation was not reported. I^2 statics were applied to assess heterogeneity in the results of the individual studies. All tests were two-tailed, and a p value of less than 0.05 was considered statistically significant. The data were analyzed in Stata version 14 (StataCorp LP, Texas, USA).

3. Results

Fig. 1 outlines the search strategy, which identified 69 publications. The titles and abstracts of the publications were screened for inclusion. Retrieved were the full texts of 40 articles, six of which met the inclusion criteria for meta-analysis (Table 1). Thirty-four articles were excluded: 25 lacked interventions, 4 were not full texts, and 5 were conference posters. Four studies were included in qualitative synthesis based on the length of PM. Two studies were analyzed with the effect size of PMI. Additionally, 1 study were excluded from qualitative synthesis but included for review based on the combination of stretching exercise with another intervention. This study combined stretching exercise with strengthening and stabilization exercises; another, stretching exercise with scapular exercise. Risk of potential bias assessments were conducted for the 6 remaining studies with Cochrane Collaboration's tool, and the results are presented in Fig. 2.

The characteristics of the 6 selected studies and network meta-analysis are showed in Table 1. The network meta-analysis showed that these studies recruited 263 participants, of which females accounted for 68.7%. Only men were included in Han's study (Han et al., 2015). Only woman included in Laudner's study (Laudner, Wenig, Selkow, Williams, & Post, 2015).The age range for the 6 trials was 18–50 years. The participants in 4 of the studies were all healthy adults without symptomatic shoulders, while those in the other 2 studies were workers with rounded-shoulder-posture (Han et al., 2015) and adults with shoulder pain (Rosa et al., 2017), respectively. In Viriyatharakij's study (Viriyatharakij, Chinkulprasert, Rakthim, Patumrat, & Ketruang, 2017), participants stretched the PM with active scapular retraction for 20 s (3 sets). Participants in Rosa's study stretched the PM by unilateral corner stretch for 4 repetitions with 1 min of stretching and 30 s of rest (Rosa et al., 2017). Healthy swimming athletes in William's study stretched the PM by applying a passive stretching protocol for two repetitions of holding the stretches for 30 s, with a 30 s break between each stretch, over 6 weeks (Williams, Laudner, & McLoda, 2013). In

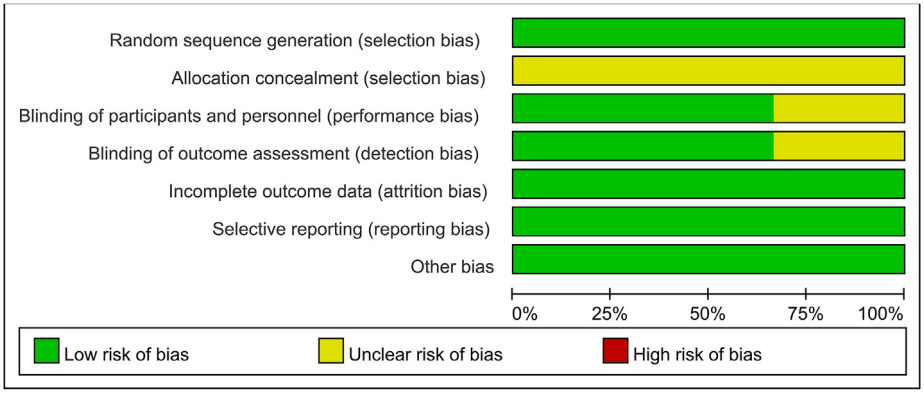
Laudner's study, healthy female swimmers received 2 sessions of PNF stretching per week for 6 weeks (Laudner et al., 2015).

3.1. Assessment of primary outcome: length of pectoralis minor

Fig. 3 and Table 2 present the results of the network meta-analysis on the primary outcome in terms of PM length. The four trials included in this review investigated patients' PM length; three of them were two-armed trials (Fig. 3). As compared with the results of usual care, PM length increased significantly with kinesiotaping, with a mean difference of 1.15 cm (95% CI: 0.2–2.1 cm). There was no significant difference in the change in the PM length between the stretching group and the control group (95% CI: −0.38 to 0.65). We also assessed the potential stretching effect on healthy subjects by excluding 25 participants with shoulder pain in Rosa's study (Rosa et al., 2017) from our network meta-analysis. This analysis found no evidence that the stretching effect was effective on healthy subjects. Additionally, Moezy et al. (Moezy, Sepehrifar, & Dodaran, 2014) also indicated that there was no significant difference between stretching exercise in combination with muscle strength training (exercise group) and modality therapy (physical therapy group) on PM length in subjects with shoulder impingement syndrome (Table 1).

3.2. Assessment of secondary outcome: index of pectoralis minor

Two studies reported PMI as an outcome for testing the effect of stretching and kinesiotaping (Table 3) (Laudner et al., 2015; Ozer,



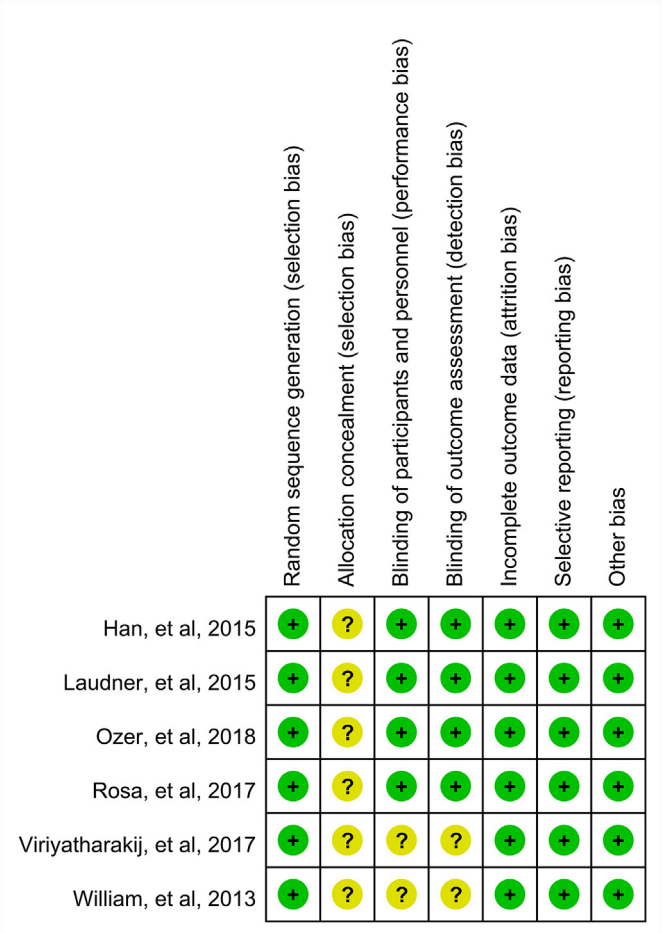


Fig. 2. Risk of bias graph (A) and summary (B): assessments for 6 studies in a Cochrane review of stretching exercise and kinesiotaping.

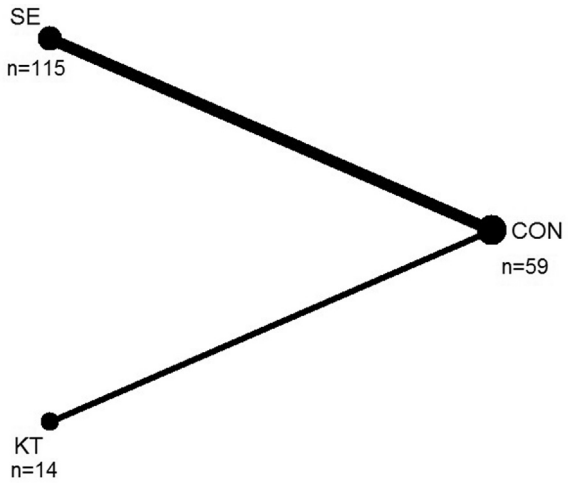


Fig. 3. Network geometry of control group (CON), stretching exercise (SE), kinesiotaping (KT). Size of the node is proportional to the number of individuals randomized to this treatment. Number of individuals is listed in brackets beside the intervention. Thickness of lines is proportional to the number of individuals randomized to each treatment comparison. The number besides the line is the number of studies.

Table 2
Network meta-analysis of pairwise comparisons: mean change from baseline in pectoralis minor length.

Mean change from baseline in pectoralis minor length (95% CI), cm		
Kinesiotaping		
1.01 (−0.07, 2.09)	Stretching exercise	
1.15 (0.20, 2.10) *	0.14 (−0.38, 0.65)	Control

*Statistically significant difference.

Table 3
Network meta-analysis of pairwise comparisons: mean change from baseline in pectoralis minor index (PMI).

Mean change from baseline in PMI (95% CI)		
Stretching exercise		
1.08 (0.29,1.87) *	Kinesiotaping	
1.40 (1.17, 1.63) *	0.32 (−0.43, 1.07)	Control

*Statistically significant difference.

Karabay, & Yesilyaprak, 2018).Participants in both studies were healthy athletes. As compared with the results of usual care and kinesiotaping, PMI increased significantly with stretching exercise, with a mean difference of 1.40 (95% CI: 1.17 to 1.63) and 1.08 (95% CI: 0.29 to 1.87). There was no significant difference in the change in the PMI between the kinesiotaping and the control group (95% CI: −0.43 to 1.07).

3.3. Publication bias and heterogeneity

The overall risk of bias across domains was judged to be low or unclear. Fig. 2 shows the risk of bias graph and a summary. Because one of the proposed interventions was active stretching exercise only, it was not possible to blind all participants. Thus, a high risk of bias in blinding participants and personnel was assessed (Rosa et al., 2017). The Begg's funnel plots (Fig. 4) displayed considerable symmetry, suggesting that no significant publication bias existed. Egger's test also showed no small study effect ($p = 0.42$). However, we were unable to assess local and global inconsistencies by using a loop-specific approach due to the insufficient number of trials.

4. Discussion

This systematic review and network meta-analysis provide evidence for the effects of stretching exercise and kinesiotaping on PM length and index in adults. The intervention with static stretching (SS) exercise alone with a dosage of 20 s to 1 min for either a short term with 3–4 sets or a long term with 2 sets for 6 weeks exerted no effect on PM length. In addition, kinesiotaping facilitated a greater improvement in PM length than did a stretching protocol alone. Nevertheless, compared with kinesiotaping alone, proprioceptive neuromuscular facilitation (PNF) stretching applied two times a week for 6 weeks resulted in an increase in PMI. Fifty-three percent of the participants included in this study were athletes (Laudner et al., 2015; Ozer et al., 2018; Williams et al., 2013). For the network meta-analysis of PMI, all participants were athletes. More research is needed to investigate the effects of stretching exercise and kinesiotaping on athletes vs. non-athletes.

In agreement with the results of our study, kinesiotaping improved posterior scapular tilting in different directions of the arm movement in elite handball female players (Van Herzeele, van Cingel, Maenhout, De Mey, & Cools, 2013). Ujino et al. reported that kinesiotaping increased shoulder range of motion (ROM), however, SS demonstrated no positive effects in healthy participants (Ujino, Eberman, Kahanov, Renner, & Demchak, 2013). By achieving immediate mechanical correction of the rounded shoulder posture, activating the lower trapezius and supraspinatus and lifting the skin and influencing the proprioceptive input from the fascia, Kinesiotaping can increase muscle length by assisting with postural alignment and relaxing the overused muscles (Han et al., 2015; Ozer et al., 2018; Schleip, 2003).

In our network meta-analysis, we noted a positive effect of PNF stretching exercise applied alone for 6 weeks on PMI. Similar short-duration stretching exercise protocols combined with strengthening or stabilisation exercises exerted positive effects on PMI and PM length (Lee et al., 2015; Moezy et al., 2014). Muscle elongation should be combined with intermittent contraction to achieve positive results. Asymptomatic participants who performed passive stretching in the end-range position did not show significant activation of stretched muscles (Weppler & Magnusson, 2010). Without the activation of stretched muscles, the effect of stretching can be limited. Thus, our proposition regarding combining muscle stretching with intermittent contraction should be investigated in future studies.

The analysis of two definitions of PM outcomes showed seemingly contradictory results; however, different stretching techniques may affect outcomes. Several stretching techniques have been considered (e.g., static, dynamic, and PNF) (Medeiros & Lima, 2017). SS involves achieving a certain ROM and keeping the muscle (group) lengthened for period. Dynamic stretching involves performing movement patterns throughout the available ROM. PNF stretching involves performing SS and isometric contractions of the muscle in a cyclic pattern. In our study, SS was not found to be effective in increasing PM length. However, in a recent study not included in our review, SS with horizontal abduction at shoulder elevation angles effectively increased the shear elastic modulus of the PM (Weppler & Magnusson, 2010). Other studies have indicated that SS can rearrange the thixotropic properties of muscle fibres (Magnusson, 1998; Morse, Degens, Seynnes, Maganaris, & Jones, 2008). These findings suggest that the relationship among the overall length, thixotropic properties, and shear elastic modulus of the PM should be further investigated. Laudner et al. reported a significant increase in PMI after the muscle energy technique, which is a PNF technique (Laudner et al., 2015). In addition, researchers have reported that dynamic stretching or PNF exerts a significant effect on straight leg raising and elongating the hamstring. (Lin, Hung, & Yang, 2011). A well-randomized controlled

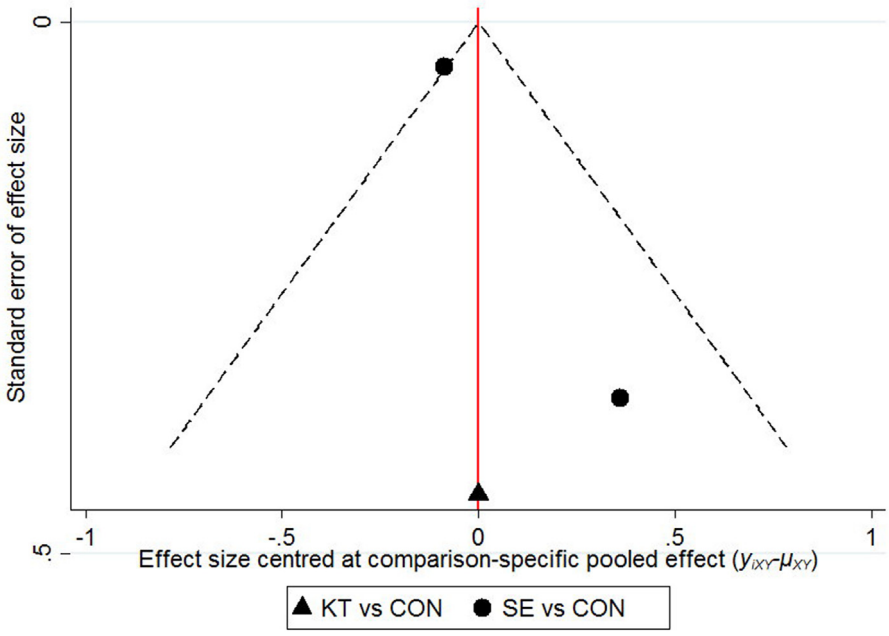


Fig. 4. Begg's funnel plots of the effects of control group (CON), stretching exercise (SE), kinesiotaping (KT).

study should be conducted to determine the effects of PM elongation with dynamic stretching or PNF.

To increase PM, PNF stretching and kinesiotaping can be used as alternative interventions in healthy people or patients with a rounded shoulder posture. In addition to the existing literature, we conclude that the positive effects of PNF stretching and kinesiotaping are convincing, and these techniques can be used to treat patients.

The strengths of this study are as follows. First, a network meta-analysis approach was employed to compare the relative efficacy of kinesiotaping and stretching exercise in adults. Second, the results of this study have good applicability to the general and clinical populations because the analysed studies included not only the healthy population but also people with shoulder pain or prolonged sitting at work. The limitations of our study include the wide variability in stretching protocols across the studies examined. The lack of blinding is the main factor affecting the risk of bias. However, blinding in randomized controlled trials for active or passive stretching is more difficult than the blinding of randomized controlled trials for medications, in which participants and investigators can easily be blinded to intervention assignments.

The need for further research on interventions for lengthening the PM should minimise potential bias by presenting a clear methodological design and concealing intervention allocation. Moreover, follow-up protocols for kinesiotaping can aid in determining both immediate and long-term effects on the PM. With regard to the clinical practice of combining kinesiotaping and stretching exercise, additional studies should be conducted to develop structured guidelines. Such guidelines would provide practical information for patients with scapular dyskinesis and poor shoulder posture related to PM tightness. To effectively enhance PM length, the benefits of intervention combined with other therapies (e.g., massage and behavioural modification techniques) should be investigated in the future.

5. Conclusion

Compared with no intervention, kinesiotaping can be beneficial for lengthening the PM. Intervention with static stretching alone has no effect on PM length. Compared with kinesiotaping and no intervention, PNF stretching can increase PMI.

Conflicts of interest

None.

Funding

None.

Ethical statements

The detailed search strategy is freely accessible in the protocol (PROSPERO ID: CRD42018089951).

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ptsp.2019.08.003.

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