Effectiveness of Soft Tissue Massage for Nonspecific Shoulder Pain: Randomized Controlled Trial

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Background. Soft tissue massage and exercise are commonly used to treat episodes of shoulder pain.

Objective. The study objective was to compare the effects of soft tissue massage and exercise with those of exercise alone on pain, disability, and range of motion in people with nonspecific shoulder pain.

Design. This was a randomized controlled trial.

Setting. The study was conducted in public hospital physical therapy clinics in Sydney, New South Wales, Australia.

Participants. The study participants were 80 people with an average age of 62.6 years (SD=12.2) who were referred to physical therapists for treatment of nonspecific shoulder pain.

Intervention. Participants were randomly assigned to either a group that received soft tissue massage around the shoulder and exercises (n=40) or a group that received exercise only (n=40) for 4 weeks.

Measurements. The primary outcome was improvement in pain, as measured on a 100-mm visual analog scale, 1 week after the cessation of treatment. Secondary outcomes were disability and active flexion, abduction, and hand-behind-back range of motion. Measurements were obtained at baseline, 1 week after the cessation of treatment, and 12 weeks after the cessation of treatment.

Results. The between-group difference in pain scores from the baseline to 12 weeks after the cessation of treatment demonstrated a small significant difference in favor of the group receiving exercise only (mean difference=14.7 mm). There were no significant differences between groups in any other variable.

Limitations. It was not possible to mask therapists or participants to group allocation. Diagnostic tests were not used on participants to determine specific shoulder pathology.

Conclusions. The addition of soft tissue massage to an exercise program for the shoulder conferred no additional benefit for improving pain, disability, or range of motion in people with nonspecific shoulder pain.

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Shoulder pain is defined as pain that is felt in the anterior and posterior shoulder complex region, excluding the spine and central anterior thoracic region.[1] Reports of shoulder pain are common throughout the developed world, with point prevalences of 7% to 26% of the adult population reporting shoulder problems.[2] Shoulder pain often leads to difficulties in carrying out activities of daily living, including work, home, and leisure activities, and creates significant social liability and economic burden for both the person and society as a whole. Although information on the health care costs and loss of productivity associated with shoulder pain is limited, the burden is thought to be substantial,[3] with people being more likely to seek health care if they are experiencing high pain intensity, high levels of disability, long duration of the complaint, and widespread pain.[4] Unfortunately, many shoulder problems are not self-limiting; approximately 40% of people complain to their general practitioners that their problem has been present for more than 1 year.[5] In many cases, shoulder pain has no clearly defined pathology or physical signs and is consequently termed "nonspecific shoulder pain."[6]

Approximately half of all people with shoulder pain are referred to physical therapists for management[7]; soft tissue massage and exercise are commonly used treatment techniques.[8,9] A recent survey of physical therapists experienced in shoulder treatment in Australia showed that exercise was considered a necessary component of effective treatment by 100% of the respondents and that soft tissue massage was so considered by 66%.[8] Similarly, a recent study in the Netherlands showed that therapists used soft tissue massage techniques to treat 91.6% of 119 patients with rotator cuff syndrome and exercise to treat 96.6% of patients. In 85% of cases, these treatments were used together.[9] Despite these findings, no randomized controlled trial has specifically investigated the effectiveness of the addition of soft tissue massage to an exercise program for the treatment of shoulder pain.[10] Therapeutic exercise for the treatment of shoulder pain has been shown to have positive effects on pain and function, but results for the effect on range of motion have been inconclusive.[11]

The proposed physiological basis for the effect of soft tissue massage on nonspecific shoulder pain is presently unclear. Myofascial trigger points may be caused by sensitized nerve fibers associated with excessive release of neurotransmitters in abnormal end plates, which, in turn, results in spontaneous electromyographic activity within that part of the muscle. It has been hypothesized that soft tissue massage reduces this discharge.[12,13] This effect has been demonstrated in the upper trapezius muscle immediately after soft tissue massage in patients with shoulder and neck pain.[14–16] Gam et al[17] investigated whether this observed effect translated into treatment efficacy and found that massage and exercise resulted in significantly fewer and less painful myofascial trigger points than no treatment for chronic neck and shoulder pain.

A second hypothesis is that soft tissue massage results in increased fibroblast activity, which improves the formation and maturation of collagen in the fascia or tendons during wound healing. This hypothesis is based primarily on animal studies, which may not be directly transferable to humans.[18] A third hypothesis arises from observations in human cadaveric studies, in which the posterior glenohumeral capsule was surgically tightened, with resultant increased anterior translation of the humeral head during arm movements across the body and superior translation of the humeral head during flexion.[19] It has been theorized that soft tissue massage decreases posterior restriction through its effect on either muscle or collagen, thus allowing the joint to operate in a more "normal" anatomical alignment and, in turn, possibly reducing the impingement of sensitive structures around the shoulder during movements.[20] Tightness in the posterior structures of the shoulder has been shown to correlate with decreased glenohumeral range of motion,[21] and soft tissue massage of this region has been shown to improve internal rotation range of motion compared with no treatment.[22] The hypothesized effect of massage treatment of the shoulder region is a reduction in restriction around the shoulder that results in reduced pain and therefore improved function.

Our recent systematic review showed low-quality evidence that soft tissue massage aimed at the glenohumeral musculature was more effective than no treatment for improving pain, disability, and range of motion in the short term for nonspecific shoulder pain.[10] Exercise therapy produced small improvements in pain but not in disability or range of motion. No study has specifically examined whether the addition of soft tissue massage to another treatment modality yields further improvements in pain, disability, and range of motion. Therefore, in the present study, we aimed to investigate whether the addition of soft tissue massage to an exercise program

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- eTable: Exercise Stages for Both Groups

for shoulder pain would improve pain, disability, and shoulder movement more than exercise alone.

Method

Design Overview

This study was a randomized controlled trial. Details about the methods used in this trial were published previously.[23] Written informed consent was obtained from all participants before entry into the study. Trial recruitment was intended to start in February 2007 on the basis of initial registration in March 2007. The registration was edited in June 2007 and, because of delays, recruitment started in January 2008.

Setting and Participants

People who had shoulder pain and were referred to the public physical therapy clinics of 2 metropolitan hospitals in Sydney, New South Wales, Australia, between February 2008 and September 2010 were invited to join the study.

All potential participants were screened for eligibility by an experienced physical therapist not otherwise involved in the trial. To be included, potential participants had to be 18 to 80 years old, referred to physical therapists for the management of shoulder pain, and able to understand spoken English. Although diagnoses were noted for potential participants referred by medical practitioners to the study, it is known that approximately 50% of shoulder pain diagnoses provided by primary care practitioners are inaccurate.[24] Because nonspecific shoulder pain was targeted in the present study, participants were not required to have any specific diagnostic tests to be included in the study.

People were excluded if they reported shoulder pain due to trauma in the preceding 4 weeks; if they had shoulder pain reproduced with neck movement, an acute inflammatory condition, or shoulder pain due to serious pathology (eg, neoplasm or recent or nonunited fracture); or if they had a workers' compensation claim relating to the shoulder pain.

Because of the nature of the treatment received during this trial, participants were unaware of the study hypothesis but not of the treatment received. Assessors were unaware of group allocation, but therapists providing the allocated interventions were not.

Sample Size

Sample size was calculated a priori on the basis of a predetermined between-group difference in the mean change on a visual analog scale (VAS) pain score. This difference was based on the magnitude of reported minimal clinically important differences in improvement in shoulder pain and on the results of our preliminary study.[25] Sample size calculations, given an effect size of 10 mm on the VAS, a standard deviation of 15 mm on the VAS, and a dropout rate of 10%, indicated the need for 40 participants in each group. This approach varied from what was initially expressed on the Australian New Zealand Clinical Trials Registry, which indicated that the primary outcome would be the Short-Form McGill Pain Questionnaire, because of the inability to add the multiple subscales in this questionnaire.

Randomization and Interventions

Participants were randomly assigned to 1 of 2 groups by a computer-generated schedule prepared off-site by an investigator not otherwise involved in the recruitment process. Assignments were provided in sequentially numbered, sealed, opaque envelopes and were opened by the treating physical therapist to ensure masking of the assessor.

Therapists providing interventions. Interventions for both groups in the study were provided by 1 of 2 physical therapists who had undergraduate physical therapy degrees and more than 10 years of experience each in the field of musculoskeletal physical therapy and who were experienced in the management of shoulder pain. These 2 therapists provided interventions to both groups because it was not possible to mask assessors to group allocation. Both therapists were provided with a 2-hour session focusing on then-relevant anatomy of the shoulder region, the proposed effects of the soft tissue massage and exercise, and the application of both the massage technique and the exercise prescription. Both therapists were assessed as being competent in the application of both the massage technique and the exercise prescription at the completion of the training by one of the researchers (P.V.).

Examination of participants. After randomization, the physical therapists providing the interventions undertook a standard musculoskeletal assessment of the shoulder of each participant, including relevant history and physical examination.[26]

Group receiving exercise only. Each of the participants allocated to the group receiving exercise only was given instruction and demonstration of an individualized shoulder exercise program in 7 treatment sessions. To allow for various degrees of impairment among participants entering the study, the treating therapist selected appropriate exercises specific to individual participants from a limited range of exercises to improve range of motion, strength, and motor control (including scapular control), and each participant

received exercises in each of these domains (eTable, available at ptjournal.apta.org). The level and intensity of exercises prescribed were determined by the treating therapist and were updated as required at each treatment session. The treating therapist demonstrated the exercises to the participant, monitored performance while the participant practiced the exercises, and provided feedback as necessary.[27] There was general agreement between the treating therapists as to how exercises would be progressed; however, they were able to prescribe and progress exercises as relevant for individual participants. All participants were instructed to continue the exercise program at home and were given clear printed instructions regarding the exercise regimen, including a description of the exercises, dosage, repetitions, and number of sessions per day.

Group receiving soft tissue massage and exercise. Each of the participants allocated to the group receiving massage and exercise was given 10 to 15 minutes of soft tissue massage in 7 treatment sessions in addition to the exercises described above. Massage was directed with the same approach as that used by van den Dolder and Roberts,[25] who demonstrated significant improvements in pain, disability, and range of motion when this technique was used compared with no treatment. Massage was directed at each of the following areas:

- Teres minor, teres major, infraspinatus, and subscapularis muscle (lateral border of the scapula) regions in full shoulder flexion
- Posterior deltoid muscle region at the end of the range of horizontal flexion
- Pectoralis major muscle region in the pectoralis major muscle stretch position
- Anterior deltoid muscle region at the end of the range of placement of the hand behind the back

The soft tissue massage was applied in the longitudinal direction along the length of the muscle with the therapist's fingertips and massage cream. The therapists were told that the massage should be at an intensity that may produce some discomfort but that this discomfort should not extend past the cessation of the massage. The therapists were allowed to concentrate more on one area of concern for the participant if this location was the focus of the symptoms.

Interventions for both groups were provided in the same treatment visit patterns: 2 treatment sessions per week for 2 weeks and then 1 treatment session per week for 3 weeks.

Outcome Measures and Follow-up

Masked assessors, previously trained in the use of the assessment instruments, obtained all outcome measurements. The primary outcome measure was a change in pain reported on a 100-mm VAS with the anchors "no pain" and "worst possible pain" at 12 weeks after the cessation of treatment.[28,29] Shoulder pain is the main complaint of people with shoulder problems,[30] and high scores are consistently associated with persistent symptoms.[31] The VAS has excellent test-retest reliability (r=.94) and correlates highly with other pain measurement tools.[32] For shoulder pain, previous studies demonstrated that the minimal clinically important differences were approximately 14% improvement in pain[33] and at least 12% improvement in disability.[34] These values were used to determine whether changes were of a magnitude considered to be clinically worthwhile.

Secondary outcome measures included reported disability and range of motion. Reported disability was measured with the Shoulder Pain and Disability Index.[35] This index contains 13 items that assess 2 domains: a 5-item subscale that measures pain and an 8-item subscale that measures disability. For the present study, the disability subscale was used by summing the responses to the items and transforming the sum to a score out of 100, with a higher score indicating greater disability. The Shoulder Pain and Disability Index has excellent internal consistency (Cronbach α=.96), excellent test-retest reproducibility (intraclass correlation coefficient [ICC]=.89; 95% confidence interval [CI]=.82, .93), and internal responsiveness (reliable change proportion=85%; 95% CI=76%, 93%).[36] Range of motion was measured for flexion, abduction, and internal rotation (hand behind back). Flexion and abduction were measured with photography, which has good interrater reliability (ICC=.73–.90).[37,38] Hand-behind-back movement was measured with a tape measure; this method has excellent intrarater (ICC=.95) and interrater (ICC=.96) reliability.[39]

In addition, participants were asked to score their global perceived improvement in pain since entry into the study as the percentage improvement in pain (PIP; from 0% to 100%) at 12 weeks after the cessation of treatment. The PIP correlates well with all components of the Short-Form McGill Pain Questionnaire.[40] Adverse events during the study were recorded by the assessors at each of the assessment points according to the categories defined by Carnes et al.[41] At 12 weeks after the cessation of treatment, participants in both groups recorded their adherence to the prescribed exercise program on a 4-point scale with the following descriptors: "all

Table 1.
Characteristics of Participants at Entry Into the Trial[a]

Characteristic	Group Receiving STM and Exercise (n=40)	Group Receiving Exercise Only (n=40)
Age (y), $\bar{X}$ (SD)	61.8 (12.5)	63.4 (12.0)
No. of men:no. of women	17:23	21:19
Median (IQR) duration of shoulder complaint (wk)[b]	4.0 (2.0–7.7)	6.0 (3.4–12.0)
Score for pain on VAS out of 100,[b] $\bar{X}$ (SD)	48.0 (23.3)	58.6 (22.5)
Score for disability on SPADI out of 100, $\bar{X}$ (SD)	47.1 (25.8)	53.7 (21.9)
ROM flexion score (°), $\bar{X}$ (SD)	97.0 (32.8)	105.2 (31.5)
ROM abduction score (°), $\bar{X}$ (SD)	98.5 (36.5)	95.7 (30.7)
ROM score for HBB above PSIS (cm), $\bar{X}$ (SD)	17.2 (14.1)	13.4 (11.1)

[a] STM=soft tissue massage, IQR=interquartile range, VAS=visual analog scale, SPADI=Shoulder Pain and Disability Index, ROM=range of motion, HBB=hand behind back, PSIS=posterior superior iliac spine.
[b] $P<.05$.

of the time," "most of the time," "some of the time," or "none of the time." Except at the baseline assessment, participants were shown their previous responses to all questionnaires before completing them again, as this approach has been shown to improve the reliability of responses.[42]

Each outcome was measured at 3 time points: before randomization, at 1 week after the cessation of treatment (5 weeks after randomization), and at 12 weeks after the cessation of treatment (17 weeks after randomization).

Data Analysis

All data analysis was conducted by a statistician who was unaware of group membership on an intention-to-treat basis. Demographic characteristics and baseline data were summarized with descriptive statistics. For estimation of treatment efficacy, between-group mean change scores

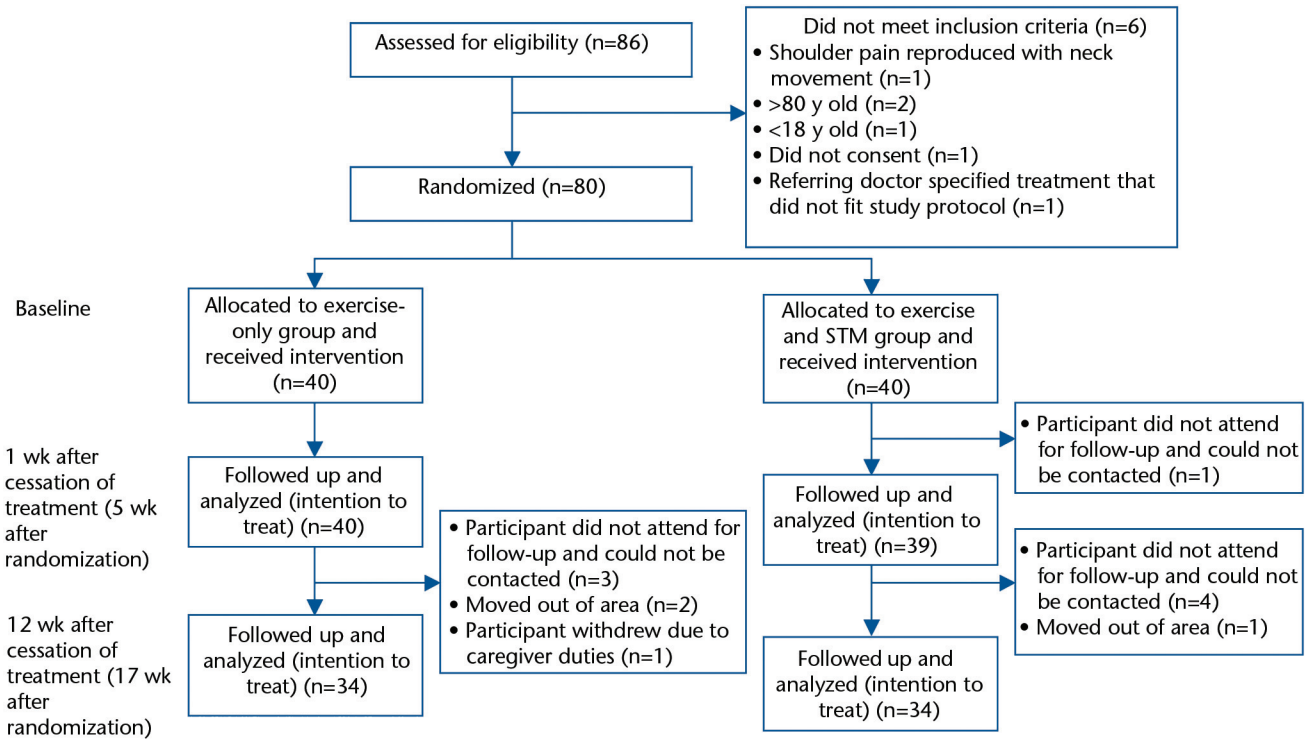

Figure 1.
CONSORT flow diagram of the progress of participants through the trial. STM=soft tissue massage.

Table 2.
Outcomes for Both Groups During the Trial[a]

Outcome	Group Receiving STM and Exercise				
	$\bar{X}$ (95% CI)				
	Baseline Assessment (n=40)	1 wk After Cessation of Treatment (n=40)	12 wk After Cessation of Treatment (n=34)	Difference Within Group From Baseline Assessment to 12 wk After Cessation of Treatment	*P*
Pain, measured with a VAS[c]	48.0 (40.6, 55.4)	33.1 (26.4, 39.8)	32.9 (25.1, 40.6)	−15.1 (−22.7, −7.5)	.001[d]
Function, measured with the SPADI[c]	47.1 (39.1, 55.1)	31.9 (24.8, 39.0)	30.2 (20.3, 40.1)	−16.9 (−23.7, −10.1)	<.001[d]
Range of motion					
Flexion[e]	97.0 (86.8, 107.2)	113.2 (104.2, 122.2)	115.2 (106.1, 124.3)	18.2 (8.5, 28.9)	<.001[d]
Abduction[e]	98.5 (86.6, 110.4)	114.1 (10.1, 123.1)	117.2 (107.5, 126.9)	18.7 (8.5, 28.9)	<.001[d]
HBB[e]	17.2 (12.8, 21.6)	21.4 (17.1, 25.7)	18.4 (12.5, 24.3)	1.2 (−3.3, 5.8)	.16

(*Continued*)

(95% CI) were compared with 2-tailed analyses of variance for all outcome measures. Important baseline characteristics of both groups were compared after completion of the trial, and any that differed significantly between groups were used as covariates in analyses of covariance. Missing data were replaced by the group mean for that variable at the particular measurement time point.

The difference between groups in the PIP scores reported at 12 weeks after the cessation of treatment was assessed with a *t* test. The difference between groups in the participants' self-reported adherence to the exercise program was determined with a Mann-Whitney *U* test. The differences between groups in the proportions of participants for whom minimal clinically important differences in pain and disability were reached at 1 and 12 weeks after the cessation of treatment were assessed with *Z*-score tests and number-needed-to-treat statistics.

Results

Eighty participants with an average age of 62.6 years (SD=12.2) were randomized (Tab. 1). Random allocation generated groups that were comparable in terms of age, disability, and range of motion; however, the group receiving exercise only had significantly higher baseline levels of pain and longer duration of symptoms. Therefore, analyses of covariance were used in statistical analyses to control for these differences. Study protocols for masking of participants to the study hypothesis and assessors to group allocation were adhered to during the trial. The CONSORT flow diagram of the progress of participants through the trial is shown in Figure 1.

Participants in the group receiving soft tissue massage and exercise improved significantly during the trial in all outcome measures except hand-behind-back range of motion (Tab. 2). Participants in the group receiving exercise only improved significantly in all outcome measures except flexion range of motion (Tab. 2). There was a significant difference between groups in pain scores over the course of the trial in favor of the group receiving exercise only (mean difference: 14.7 mm; $P=.042$) (Tab. 2). There were no significant between-group differences in the secondary outcomes—disability, flexion, abduction, and hand-behind-back range of motion. The changes in mean scores are shown in Figure 2.

A significantly higher proportion of participants in the group receiving exercise only reached the threshold of 14% improvement in pain at 1 week after the cessation of treatment. However, there was no difference at 12 weeks after the cessation of treatment. There were no differences between groups at either 1 week or 12 weeks after the cessation of treatment (Tab. 3). There was no difference between groups in the distribution of PIP scores at 12 weeks after the cessation of treatment (Tab. 4). Most participants in both groups reported adherence to the exercise program (Tab. 4) as prescribed by their therapists either most of the time or some of the time. There were no reported adverse effects for participants in either group in this trial.

Discussion

The aim of the present study was to investigate whether adding soft tissue massage to an exercise program for shoulder pain would improve pain, disability, and shoulder movement more than exercise alone. Our results indicated that there were no significant differences between the

Table 2.
Continued

Group Receiving Exercise Only					Difference Between Groups From Baseline Assessment to 12 wk After Cessation of Treatment, $\bar{X}$ (95% CI)[b]	*P*
$\bar{X}$ (95% CI)						
Baseline Assessment (n=40)	1 wk After Cessation of Treatment (n=39)	12 wk After Cessation of Treatment (n=34)	Difference Within Group From Baseline Assessment to 12 wk After Cessation of Treatment	*P*		
58.6 (51.6, 65.6)	26.5 (19.8, 33.2)	28.8 (19.6, 38.0)	−29.8 (−40.2, −19.4)	<.001[d]	−14.7 (−24.1, −5.3)	.04[d]
53.7 (46.9, 60.5)	29.9 (22.1, 37.7)	28.7 (19.9, 37.5)	−25.0 (−32.6, −17.4)	<.001[d]	−8.1 (−15.3, −0.9)	.33
105.1 (95.3, 114.9)	121.0 (113.8, 128.2)	116.1 (106.5, 125.7)	11.0 (1.3, 20.7)	.10	7.2 (−2.4, 16.8)	.31
95.7 (86.2, 105.2)	123.8 (113.8, 133.8)	113.9 (101.9, 125.9)	18.2 (9.6, 26.8)	.001[d]	0.5 (−8.9, 9.9)	.29
13.4 (10.0, 16.8)	20.5 (17.6, 23.4)	22.6 (18.8, 26.4)	9.2 (5.6, 12.8)	<.001[d]	−8.0 (−12.1, −3.9)	.60

[a] STM=soft tissue massage, CI=confidence interval, VAS=visual analog scale, SPADI=Shoulder Pain and Disability Index, HBB=hand behind back.
[b] A positive value indicated a difference between groups from the baseline assessment to 12 weeks after the cessation of treatment in favor of the group receiving STM and exercise.
[c] A decrease during the trial indicated improvement.
[d] Significant at α=.05.
[e] An increase during the trial indicated improvement.

groups in disability and range of motion, except for a small mean improvement in pain in favor of the group receiving exercise only. The proportion of participants reporting a clinically meaningful difference was higher in the group receiving exercise only at 1 week after the cessation of treatment (87.5% versus 61.5%; number needed to treat=3.8) but not at 12 weeks after the cessation of treatment. There were no differences between groups in the proportion of participants reporting improvement in disability above the minimal clinically important difference threshold at either 1 or 12 weeks after the cessation of treatment. It should be kept in mind that the group receiving exercise only reported higher pain scores at baseline; this factor may have resulted in a regression to the mean effect over the course of the trial, with larger changes being observed in this group.[43] Therefore, compared with the exercise program alone, the addition of massage to an exercise program for the treatment of shoulder pain did not result in additional benefit in the intermediate term. It should be noted that, over the course of the trial, both groups showed improvements in pain and disability at levels that would have been considered clinically worthwhile by the participants.[27,28]

From a practical aspect, it should be kept in mind that the addition of soft tissue massage to exercise therapy for the shoulder would involve more of a clinician's time without adding apparent benefit. This approach would add both cost and additional burden for both the patient and the clinician. The fact that exercise therapy is a more active intervention than soft tissue massage may benefit patients with shoulder pain through increased self-efficacy and the promotion of increased activity which, in turn, decreases fear avoidance behaviors.[44]

In our previous study, the short-term effects of the type of soft tissue massage used in the present study were compared with the results for a control group, which received no treatment.[25] In that study, we found that soft tissue massage resulted in significantly greater improvements in range of motion, pain, and disability than no treatment (ie, people on a waiting list). Taken together with the results of the present study, the findings of that study suggested that, compared with no treatment, soft tissue massage may be effective in the short term; however, there is no additive effect when it is combined with exercise in either the short term or the intermediate term.

The only systematic review of the effects of soft tissue massage on nonspecific shoulder pain[10] found low-quality evidence that, compared with no treatment, soft tissue massage produced moderate immediate effects in active flexion and abduction range of motion, pain, and disability scores immediately after the cessation of treatment. Studies on the longer-term effects have not been undertaken. The present study extends scientific knowledge about the effectiveness of soft tissue massage, as no previous study specifically examined clinical outcomes after the addition of soft tissue massage to exercise therapy for the treat-

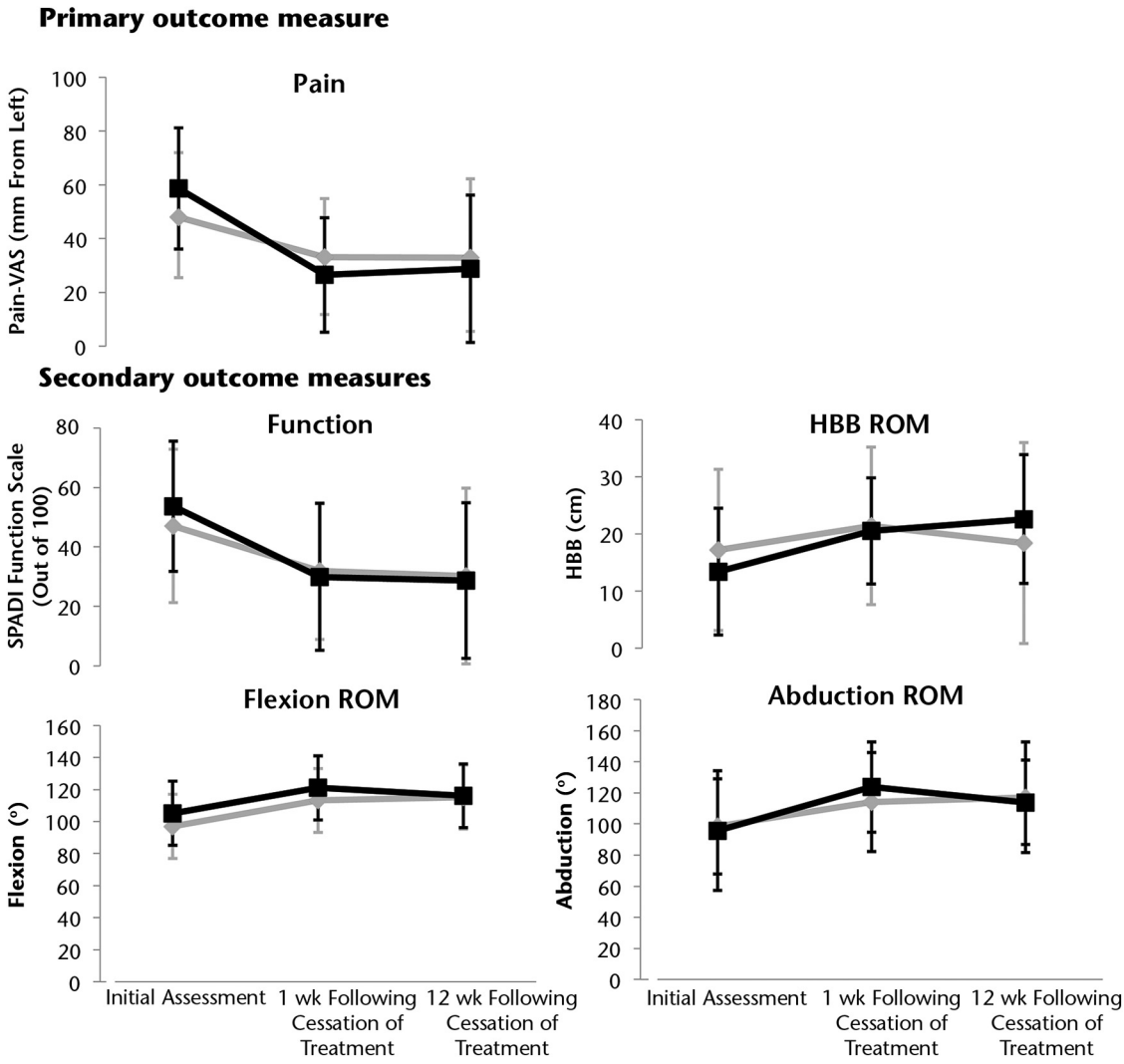

Figure 2.
Mean scores (SD) during the trial. HBB=hand behind back, ROM=range of motion, SPADI=Shoulder Pain and Disability Index, VAS=visual analog scale.

ment of nonspecific shoulder pain. A meta-analysis of studies of exercise programs used for the management of shoulder pain demonstrated improvements in reported pain that were greater than those obtained with placebo, minimal, or no treatment (pooled weighted mean=9.8/100; 95% CI=0.6, 9.0); however, the magnitude of the improvements was small and not likely to be considered clinically worthwhile.[27,28] Exercise was shown not to improve shoulder disability (pooled weighted mean=5.7/100; 95% CI=−3.3, 14.7) and had no greater effect on flexion or abduction range of motion than placebo, minimal, or no treatment.

In the present study, all potential participants who had shoulder pain, were referred to physical therapists, and satisfied our inclusion criteria—regardless of reported diagnoses—were invited to enter our trial. There may have been a subset of participants in our study population for whom soft tissue massage was effective, but this possibility was not explored in the present study. For example, the effects on acute shoulder pain may differ from the effects on chronic shoulder pain. Further exploration to identify people whose shoulder pain is responsive to exercise and people for whom massage confers additional benefit is essential in the search for improved treatment efficacy for people with shoulder pain. Evidence regarding the efficacy of manual therapy, soft tissue mobilization, and exercise for pain in other regions of the body, such as the low back, is emerging.[45]

The rates of self-reported exercise adherence were similar for the 2 groups in the present study, but

Table 3.
Proportions of Participants for Whom the Minimal Clinically Important Difference (MCID) Threshold Was Met[a]

Outcome	Group	From Baseline to 5 wk After Randomization			From Baseline to 12 wk After Cessation of Treatment		
		Met MCID:Did Not Meet MCID (No. of Participants)	Z Score	NNT	Met MCID:Did Not Meet MCID (No. of Participants)	Z Score	NNT
Pain	Exercise only	35:5	2.65[b]	3.8[c]	28:6	1.65	5.7[c]
	Exercise and soft tissue massage	24:15			22:12		
Disability	Exercise only	30:10	1.97[d]	4.7[c]	23:11	0.00	NA
	Exercise and soft tissue massage	21:18			23:11		

[a] NNT=number needed to treat, NA=not applicable.
[b] $P<.01$ in favor of the group receiving exercise only.
[c] NNT results were in favor of the group receiving exercise only.
[d] $P<.05$ in favor of the group receiving exercise only.

adherence was not particularly high for either group. The effect that these adherence rates may have had on outcomes is unknown because the present study did not have adequate power to investigate the effect of higher rates of adherence to exercise regimens. The present study was pragmatic in design—to reflect the current practice in exercise prescription for shoulder pain and to allow for programs to be individualized in type and intensity of exercises for each participant. A recent study[46] showed that it is important to consider dose when developing exercise treatments for shoulder pain, with high-dose exercise regimens being superior to low-dose exercise regimens for improving both pain and function. Future study designs could incorporate dose.

Massage has been shown to be an effective treatment modality for other regions of the body. A Cochrane systematic review concluded that massage was beneficial for improving both symptoms and disability in patients with subacute and chronic low back pain, with beneficial effects lasting for at least 12 months after treatment[47] and with effects having a magnitude similar to that of effects obtained with exercise. The addition of exercise and education to massage further improved these gains. For nonspecific shoulder pain, however, the addition of soft tissue massage does not appear to improve pain, disability, or range of motion.

Table 4.
Reported Percentage Improvement in Pain (PIP) Score and Self-Reported Adherence to Exercise Program at 12 Weeks After Cessation of Treatment

Measure	No. of Participants in Group Receiving:	
	Exercise and Massage (n=34)	Exercise Only (n=34)
Reported PIP, %[a]		
81–100	12	10
61–80	7	10
41–60	7	5
21–40	1	1
0–20	7	8
Self-reported adherence to exercise program[b]		
No response	2	3
None of the time	1	4
Some of the time	7	10
Most of the time	17	13
All of the time	7	4

[a] As determined with the *t* test for between-group differences, the *P* value was .61 (not significant).
[b] As determined with the Mann-Whitney *U* test for between-group differences, the *P* value was .068 (not significant).

In the present study, a high proportion of potential participants who were screened for the trial were retained because of the broad inclusion criteria. This feature of the present study is in accordance with the concept of nonspecific shoulder pain, for which no clear link between a pathological process and a person's presenting symptoms of pain in the shoulder region can be made.[6]

There were no reported adverse effects in the present study, consistent with the findings of our previous systematic review[10] as well as other studies demonstrating no or minimal adverse events with either soft tissue massage or exercise

programs.[48] These data suggest that both massage and exercise can be considered safe treatment modalities.

Limitations

The fact that all potential participants who had shoulder pain, were referred to physical therapists, and satisfied our inclusion criteria were invited to enter our trial can be considered a study limitation. A further study with people who have accurately diagnosed pathology of the shoulder may reveal specific groups of people who will benefit most from treatments. Because of the nature of the treatment in the present study, it was not possible to mask therapists or participants to group allocation; however, participants were unaware of the study hypothesis, and both arms of the study involved active treatments. The data in the present study are supportive only of the conclusions for the end points included in the study. It should be kept in mind that massage may show additional benefit for endpoints other than those included in the present study, such as satisfaction with treatment.

Conclusion

The addition of soft tissue massage to an exercise program for the shoulder provided no additional benefit for improving range of motion, pain, or disability in people with nonspecific shoulder pain.

Dr van den Dolder and Professor Refshauge had the idea for the trial. Dr van den Dolder conducted the trial, undertook the data analysis, and wrote the article. Dr Ferreira and Professor Refshauge provided guidance and editing. Professor Refshauge is the guarantor for the article. The authors thank Mr Andrew Lawson, Ms Kristen Haeney, Mr David Roberts, and Mr Mark Halliday for their assistance with data collection during the trial and Professor Robert Herbert for his input into the trial design.

Ethical approval was received from the University of Sydney as well as Sydney South West and Sydney South East Illawarra Area Health Services.

The study was registered with the Australian New Zealand Clinical Trials Registry (ACTRN12607000336482).

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