

Randomized Trial of Therapeutic Massage for Chronic Neck Pain

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Objectives: Little is known about the effectiveness of therapeutic massage, one of the most popular complementary medical treatments for neck pain. A randomized controlled trial was conducted to evaluate whether therapeutic massage is more beneficial than a self-care book for patients with chronic neck pain.

Methods: Sixty-four such patients were randomized to receive up to 10 massages over 10 weeks or a self-care book. Follow-up telephone interviews after 4, 10, and 26 weeks assessed outcomes including dysfunction and symptoms. Log-binomial regression was used to assess whether there were differences in the percentages of participants with clinically meaningful improvements in dysfunction and symptoms (ie, >5-point improvement on the Neck Disability Index; >30% improvement from baseline on the symptom bothersomeness scale) at each time point.

Results: At 10 weeks, more participants randomized to massage experienced clinically significant improvement on the Neck Disability Index [39% vs. 14% of book group; relative risk (RR) = 2.7; 95% confidence interval (CI), 0.99-7.5] and on the symptom bothersomeness scale (55% vs. 25% of book group; RR = 2.2; 95% CI, 1.04-4.2). After 26 weeks, massage group members tended to be more likely to report improved function (RR = 1.8; 95% CI, 0.97-3.5), but not symptom bothersomeness (RR = 1.1; 95% CI, 0.6-2.0). Mean differences between groups were strongest at 4 weeks and not evident by 26 weeks. No serious adverse experiences were reported.

Conclusions: This study suggests that massage is safe and may have clinical benefits for treating chronic neck pain at least in the short term. A larger trial is warranted to confirm these results.

Key Words: chronic neck pain, therapeutic massage, clinical trial, primary care patients

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Neck pain is a common health problem in the United States and other developed countries. It has been estimated that about 70% of adults are afflicted by neck pain at some time in their lives,^{1,2} 10% to 40% of adults are bothered by neck pain each year,³ 10% to 15% of adults

report neck pain that has persisted more than 6 months in the past year,² and 5% of adults are currently experiencing disabling neck pain.¹ Although a multiplicity of options are available for treating neck pain, little solid evidence exists to guide clinicians and patients regarding the most effective treatments. Standard medical practice employs rest, medication, physical medicine modalities, and education.^{4,5} Medications, especially nonsteroidal anti-inflammatories, and referral for physiotherapy were the most common treatments used by general practitioners in a recent study of how primary care physicians diagnose and treat patients with chronic neck pain.⁶ Neck pain is the second most common condition for which complementary and alternative medical (CAM) therapies are used.⁷ In the United States, chiropractic and massage are the most commonly used CAM therapies for neck pain.⁷ Almost 1 in 4 chiropractic visits and 1 in 5 massage visits are for neck symptoms.⁸⁻¹⁰ Although therapeutic massage is one of the most popular CAM treatments for neck pain, few studies have evaluated its effectiveness for this condition and we found no studies that actually studied massage as it is commonly practiced in the United States. We therefore conducted this exploratory pragmatic clinical trial in a primary care population to evaluate the value of therapeutic massage as a treatment for chronic neck pain.

MATERIALS AND METHODS

Study Design and Setting

This randomized, parallel-group trial compared the effectiveness and safety of therapeutic neck massage with a self-care book for patients whose neck pain had persisted at least 12 weeks. The study was conducted at Group Health, a nonprofit, integrated healthcare system serving approximately 500,000 enrollees in Washington State and Idaho. The institutional review board at Group Health approved the study protocol. All study participants gave informed oral consent before eligibility screening and informed written consent before the baseline interview and randomization.

Participants

Between March and July, 2004, Group Health enrollees between 20 and 64 years of age who had received primary care for neck pain at least 3 months prior were mailed a letter describing the study. Patients who returned statements of interest were telephoned by a research assistant who assessed their eligibility for the study. After eligible and interested patients signed the consent forms, interviewers telephoned them again to collect baseline data and randomize them to treatment group. Potential participants were excluded if they (1) had neck pain likely due to a nonmechanical cause (eg, metastatic cancer, fractured vertebrae, spinal stenosis); (2) had complex neck pain or

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neck pain potentially inappropriate for massage (cervical radiculopathy, prior neck surgery, litigation for neck pain, motor vehicle accident within past 3 months); (3) had unstable serious medical or psychiatric conditions or dementia; (4) had minimal neck pain (rating of < 3 on 0 to 10 point bothersomeness scale) or had had neck pain lasting less than 12 weeks; (5) were currently receiving other treatments for neck pain apart from medications; (6) had used massage for neck pain within the last year; or (7) could not speak or understand English.

Randomization

Using a computer program with variable block sizes of 4 or 6, treatment assignments were randomly generated and placed in opaque, sequentially numbered envelopes by a researcher not involved in patient recruitment or randomization. The envelopes were stored in a locked filing cabinet until needed for randomization.

Treatments

Participants in the trial retained access to the medical care available as part of their insurance benefits. Those randomized to massage received up to 10 massage treatments over a 10-week period, with the exact number of visits based on each participant's clinical progress as determined by the massage therapist, based on their findings and the comments of the participant. Massage treatments were provided without cost to the study participants. Nine licensed massage practitioners with at least 5 years of experience (median = 7.5 y) who were members of a network of CAM practitioners provided the treatments in their private offices. Participants were assigned a massage therapist according to geographic location and schedule availability. The massage protocol permitted a variety of commonly used Swedish and clinical massage techniques and allowed massage therapists to make typical self-care recommendations, such as to exercise or to drink more water and is described in detail elsewhere.¹¹

Participants randomized to the self-care group were mailed a copy of *What to Do for a Pain in the Neck* by Jerome Schofferman, MD.¹² This book includes information on potential causes of neck pain, neck-related headaches, whiplash, recommended strengthening exercises, body mechanics and posture, conventional treatment, complementary therapies for neck pain, and first aid for intermittent flare-ups. No additional instruction about using the book was provided.

Outcome Measures

At baseline and 4, 10, and 26 weeks after randomization, participants were interviewed by telephone interviewers unaware of the treatment group. Participants received \$5 for completing the 10-week interview and \$10 for completing the 26-week interview. In addition to assessing the primary and secondary outcomes, the baseline telephone interview asked about sociodemographic characteristics, neck pain history and the current episode, health status and knowledge of and expectations about the helpfulness of massage and self-care education.

Our primary outcomes were neck-related disability and symptom bothersomeness. The Neck Disability Index (NDI), a 10-item (0 to 50 points or 0 to 100 percentage points) questionnaire that has high internal consistency and test-retest reliability,¹³ was used to measure neck-related

disability. An 11-point (0 to 10) numerical rating scale was used to assess how bothersome participants felt their neck pain had been in the previous week. A similar measure showed good construct validity in earlier research for back pain.¹⁴ These outcomes were evaluated as both continuous and dichotomous variables. For the dichotomous variables, improvement was defined as a decrease of 5 or more points on the NDI or a decrease of 30% or more on the bothersomeness scale. The cut points for the NDI values have been previously shown to be most strongly associated with patients' global rating of their improvement (ie, "better or much better" compared with no improvement).¹⁵

Secondary outcomes included a newer measure of neck pain disability, the Copenhagen Neck Functional Disability Scale,¹⁶ general health status as assessed by the Short Form-36,¹⁷ degree of restricted activity as indicated by patient responses to 2 questions,¹⁸ use of medications in the last week, and a 1-question rating of global improvement. We assessed global improvement by asking participants: "Compared to the neck pain you felt before you began this study, is your neck pain now... completely gone, much better, better, a little better, about the same, a little worse, or much worse"? We also collected self-reported information on all treatments used for neck pain during the study period. After all other outcome data were collected at the 10-week interview, we asked participants receiving massage about adverse experiences. Specifically, we asked participants: "Do you believe there was anything about your massage treatments that caused you to feel significant discomfort, pain, or harm" and if they replied yes, to explain what happened.

Statistical Analysis

The study was designed to have 80% power to detect an effect size of 0.75 with a 2-sided α of 0.05. Intention to treat analyses were used. Baseline characteristics were compared between groups with the use of χ^2 tests for binary variables, t tests for comparing means of continuous variables, and the Mann-Whitney U test for comparing distributions of ordinal variables. Continuous outcome variables were analyzed using linear regression, and dichotomous outcome variables were analyzed using log-binomial regression. We fit regression models using generalized estimating equations¹⁹ with an exchangeable correlation structure to adjust for possible correlation within patients over the 3 follow-up time points. We included separate treatment effects for each follow-up time point, and adjusted for the baseline value of the outcome. All P values are 2 sided with an α of 0.05 used to determine statistical significance.

RESULTS

Patient Recruitment and Follow-up

Patients were recruited for the study between March and October, 2004. Among the 222 Group Health enrollees who expressed interest before the recruitment period ended, 64 were randomized, 15 refused, 139 were ineligible, and 4 could not be contacted (Fig. 1). The most common reasons for ineligibility were neck pain lasting less than 12 weeks (18%), evidence of cervical radiculopathy (16%), and the use of massage for neck pain in the past year (14%). Thirty-two participants were randomized to massage and 32 to the self-care book. Follow-up rates exceeded 90% at the 4, 10, and 26-week time points.

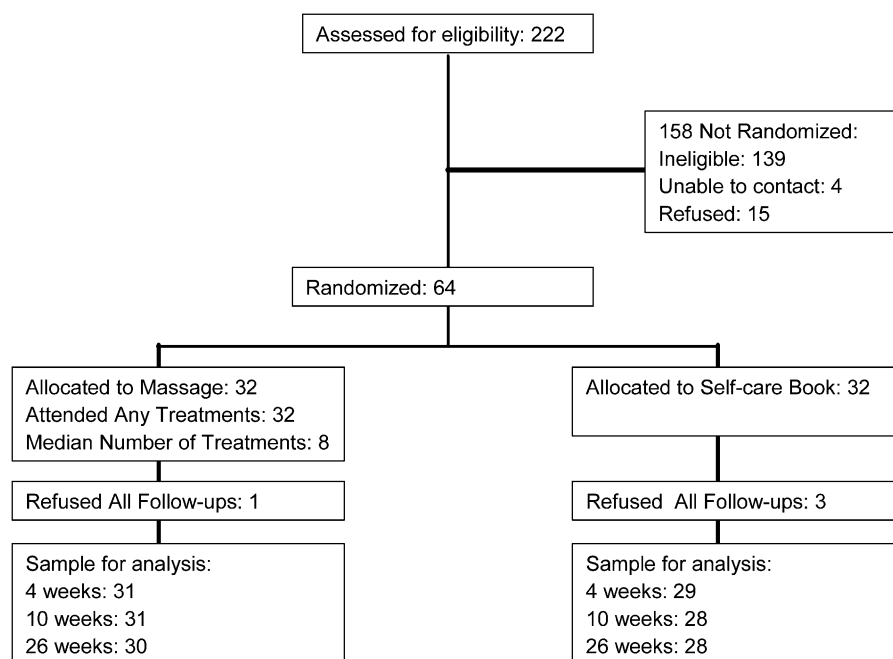


FIGURE 1. Participant Flow.

Baseline Characteristics

The typical study participant was white, female, between 40 and 50 years of age, married, employed, and had attended college (Table 1). The average time since first neck pain was 7.6 years and 81% had had their current episode for at least a year. Few participants reported recent work loss or restricted activity, but more than half had used medications in the previous week, primarily nonsteroidal anti-inflammatory medicines. Participants had higher expectations of helpfulness for massage than for self-care.

Study Treatments

All participants in the massage group made at least 1 visit for massage (median of 8; range, 1 to 10 with 79% making 7 or more visits). Visits lasted a median of 75 minutes at the first visit and 60 minutes thereafter. In response to a question about the need for further treatments, massage therapists indicated that 87% of the participants were ready to be discharged at the end of the last visit they made. All practitioners used more than 1 massage technique at each visit (a median of 7 techniques, with a range of 4 to 15 per visit). The most common techniques used were kneading (frequently used by all 9 massage therapists); friction (frequently used by 8 therapists), and clinical gliding (frequently used by 7 therapists). Swedish gliding, traction, and trigger point therapy were frequently used by 6 of the therapists. All of the massage therapists reported massaging muscles in the neck, 8 reported massage of the upper back (especially the trapezius muscle), 5 reported massage of other parts of the back, 4 reported massage to the pectoral muscles, and another 3 reported massaging the rotator cuff or the arms. Massage to other areas of the body, such as the legs, feet or hands, was less commonly reported.

All the therapists made self-care suggestions to virtually all (94%) of their patients. The most common suggestions were stretching (made by 9 therapists), body awareness (made by 8 therapists), and increasing water intake (made by 7 therapists). Only 1 massage therapist, who often incorporated acupressure into her treatments, reported being constrained by our protocol, which prescribed acupressure. All but 1 participant in the self-care group reported reading at least some of the book, with 85% reporting having read at least one-third of it.

Nonstudy Treatments

During the 10-week intervention, 13% of the participants in the massage group versus 21% in the book group reported making visits to nonstudy healthcare providers for neck pain ($P = 0.49$). Chiropractors ($n = 4$) were the most common healthcare provider seen. Only 1 participant in the control group received massage. Over the 6-month study period, 37% of the massage group and 25% of the self-care group visited a healthcare provider ($P = 0.40$). Primary care providers ($n = 7$), chiropractors ($n = 7$), and massage therapists ($n = 10$) were the most common type of provider visited. Seven participants in the massage group made a visit to a massage therapist after their treatment period had ended compared with 3 in the control group.

Functional Status and Symptoms

Mean scores on the NDI declined more in the massage group than in the self-care group during the first 4 weeks of treatment (Table 2). This initial benefit of massage persisted throughout the 26-week follow-up (Fig. 2), although these differences were statistically significant only at 4 weeks (Table 2). We also found that a greater proportion of the massage group than the self-care group reported a clinically meaningful improvement in the NDI (ie, at least 5 points) at 4, 10, and 26 weeks (Table 3). The difference between the

TABLE 1. Baseline Characteristics of 64 Patients With Chronic Neck Pain by Treatment Group

Characteristic	Treatment Group		Total (n = 64)
	Massage (n = 32)	Book (n = 32)	
Age, mean (SD), y	47.4 (12.3)	46.4 (11.3)	46.9 (11.7)
Women, %	68.8	68.8	68.8
Attended some college, %	81.3	81.3	81.3
White, %	87.1	81.3	84.3
Married, %	78.1	59.3	68.8
Family income > \$35,000/y, %	74.1	83.3	78.9
Employed or self-employed, %	84.4	84.4	84.4
Smoker, %	9.4	6.3	7.8
SF-36 physical component score, mean (SD)	46.0 (5.6)	44.1 (8.0)	45.0 (6.9)
SF-36 mental health component score, mean (SD)	51.9 (7.0)	53.1 (7.6)	52.5 (7.3)
Years since first neck pain episode, mean (SD)	7.3 (6.9)	7.9 (9.4)	7.6 (8.3)
Ever had neck injections, %	9.3	3.1	6.3
Pain has lasted > 1 y, %	80.6	80.6	80.6
Symptom bothersomeness during the past week (0 to 10 scale), mean, SD	4.8 (2.3)	4.9 (1.8)	4.9 (2.0)
Copenhagen Scale (0 to 30 scale), mean (SD)	9.3 (4.6)	10.3 (5.7)	9.8 (5.2)
Neck Disability Index (0 to 50 scale), mean (SD)	14.2 (5.0)	14.2 (4.7)	14.2 (4.8)
> 1 work-loss day due to neck pain in past month, %	0	16.7	8.2
> 7 d restricted activity due to neck pain in the past month, %	12.5	12.5	12.5
Used medication for neck pain in past week, %	56.3	62.5	59.4
Taking NSAIDs, %	46.9	53.1	50
Taking narcotic analgesics, %	6.3	6.3	6.3
Very satisfied with overall care for neck pain, %	11.1	13	12
Knowledge about massage, mean (SD) (1 to 5 scale)	2.3 (1.1)	2.3 (1.2)	2.3 (1.1)
Median expectation for helpfulness of massage (0 to 10 scale)	7	7.5	7
Median expectation for helpfulness of self-care book (0 to 10 scale)	5	5	5
Confidence to manage future neck pain by oneself, % strongly agree	10	14	12

NSAID indicates nonsteroidal anti-inflammatory drug; SF, Short Form.

groups was most pronounced during the 10 weeks of the treatment period.

The mean scores for symptom bothersomeness also declined more quickly in the massage group than in the self-care group, but these differences were no longer statistically significant by 10 weeks and virtually disappeared by 26 weeks (Fig. 3; Table 2). Similarly, a significantly higher proportion of the massage group reported a clinically meaningful change in the symptom bothersomeness score during the 10-week treatment period, but those differences were attenuated by 26 weeks (Table 3).

Secondary Outcomes

The Copenhagen Neck Functional Disability Scale was relatively insensitive to change and showed only modest differences between groups at 4 and 10 weeks [4 wk: mean score difference (95% confidence interval), -1.6 (-3.4 - 0.24); $P = 0.089$; 10 wk: mean score difference (95% confidence interval), -0.7 (-2.8 - 0.15); $P = 0.55$]. The Short Form-36 Physical and Mental Health Component Scores did not differ significantly between groups. Few individuals reported neck-related work loss or restricted activity during the study. Participants in the massage group were more likely to report they were “better” or “much better” on the patient global rating of improvement at all follow-up times, with the greatest between group difference at 4 weeks (Table 3). Medication usage, which was similar at baseline, did not change in the massage group but increased by 14 percentage points in the book group at 26 weeks.

Adverse Experiences

No moderate or severe adverse experiences were reported. Nine patients reported mild adverse experiences, which did not result in disruption of daily activities, that were likely attributable to massage: 5 participants reported discomfort or pain during 1 or more of their massage treatments, 3 participants reported increased soreness after treatment and 1 participant, who had migraines, reported nausea for a day after each treatment. One of these participants discontinued treatments because of pain after the first treatment.

DISCUSSION

This study suggests that therapeutic massage has clinically important benefits at least in the short term for persons with chronic neck pain. Our findings are unlikely to be due to other treatments for neck pain, as other treatments were used infrequently in both groups. Nor can the results be attributed to greater medication use in the massage group, because this did not occur. Furthermore, these findings are unlikely due to baseline differences between the groups as the groups were quite similar across a broad range of measures. In this study, the NDI was more sensitive to change than the Copenhagen Scale, a finding that has been reported previously.²⁰

Recently, Ezzo et al²¹ published a systematic review of 19 trials of massage for mechanical neck disorders. However, 13 of these included massage as part of a multimodal physiotherapy intervention and were unable to tease apart the relative contribution of massage. Moreover,

TABLE 2. Mean Score Differences of Bothersomeness and Disability Between Treatments at 4, 10, and 26 weeks, Controlling for Baseline Scores*

Follow-up Period	Neck Disability Index		Symptom Bothersomeness	
	Mean Score Difference (95% CI)	P	Mean Score Difference (95% CI)	P
4 wk	−2.1 (−4.0 to −0.03)	0.047	−1.6 (−2.5 to −0.7)	0.0006
10 wk	−2.3 (−4.7 to 0.15)	0.066	−1.2 (−2.5 to 0.1)	0.081
26 wk	−1.9 (−4.4 to 0.63)	0.14	−0.14 (−1.5 to 1.2)	0.84

*Mean difference and 95% CI are from generalized estimating equation models.

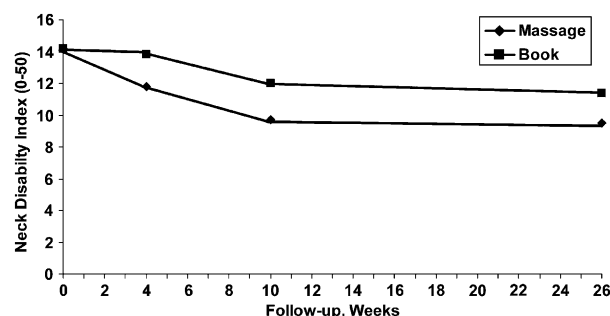
these trials did not describe how much massage was actually administered. Of the 6 “massage-only” trials reviewed, 2 involved only 1 treatment session and 1 each studied self-administered massage, persons with headache of “cervicogenic origin,” Chinese massage, and Swedish massage. In this last trial, Irnich et al²² found that compared with acupuncture or sham laser treatment, massage was less likely to result in improvements in motion-related pain. Dysfunction due to neck pain was not measured. The “dose” of massage used in that study (five 30-min treatments) was substantially less than in the present study. Furthermore, the massage given in the Irnich et al study does not resemble conventional massage practice in the United States, where therapy sessions would be twice as long, provided by a licensed massage therapist, and include a wider range of massage techniques and self-care recommendations.¹⁰ Thus, none of these previous studies of massage shed light on the usefulness of the type and dose of massage used in this study or included the type of massage received by the general public seeking therapeutic massage for neck pain.

Our findings raise the question of the most clinically useful way to present a study's results. Typically, studies of treatments for spine pain display results as mean differences between groups (or from baseline). However, such data do not always highlight important clinical differences between groups.²³ For example, our dichotomized results for the primary outcome measures showed stronger benefit for massage than the mean change between groups. Clinicians often characterize patients as having benefited or not from the treatments. Displaying study outcomes as the proportion receiving each treatment who have benefited to a clinically meaningful extent will make the study results easier for clinicians to interpret. One downside of this approach is that if the main study outcomes are dichotomized as improved (to an important extent) or not, the

required sample sizes to detect a 10% to 20% difference in the proportion who have improved would usually be larger than that required to detect a mean change equal to the minimum clinically important difference.

Our trial evaluating massage for neck pain was not designed to tease apart the specific effects of soft-tissue manipulation from those attributable to the patient-provider interaction, the home practice recommendations, or expectations of the patient. Thus, our trial cannot shed light on which aspects of the massage experience might have been responsible for the benefits seen. Rather, we conducted a more pragmatic trial to evaluate massage for neck pain. There were clearly differences between the 2 groups regarding patient provider interactions as everyone in the massage group, but only about 1 in 5 persons in the self-care group visited at least 1 type of healthcare provider during the intervention period. However, this design is most appropriate for answering clinical questions regarding the benefits of massage therapy for patients with chronic neck pain seen by primary care providers. Reassuringly, the mean scores on the NDI were comparable to those of primary care neck pain patients in other therapeutic trials.^{15,24,25}

Nevertheless, our study includes some important methodologic strengths, notably a treatment protocol that reflected common practice, a rigorous randomization procedure, good adherence to treatment recommendations, high follow-up rates, and the use of recommended outcome measures administered by interviewers unaware of treatment group. Limitations of this study include modest size, the impossibility of masking people to study treatment (as is generally true of studies of physical treatments),

**FIGURE 2.** Mean Neck Disability Index scores (0 to 50 points) at baseline, 4, 10, and 26 weeks by treatment group.**TABLE 3.** Relative Risks Associated With Improvement in Disability and Pain for Massage at 4, 10, and 26 Weeks*

	Massage	Book	Relative Risk	95% CI	P
Improvement of 5+ points on Neck Disability Index, %					
4 wk	35	7	5.1	(1.2-21.3)	0.023
10 wk	39	14	2.7	(0.99-7.5)	0.052
26 wk	57	31	1.8	(0.97-3.5)	0.061
Improvement of bothersomeness score by > 30%, %					
4 wk	48	10	4.7	(1.5-14.5)	0.008
10 wk	55	25	2.1	(1.04-4.2)	0.038
26 wk	43	39	1.1	(0.6-2.0)	0.80
Better or much better on Global Rating of Improvement, %					
4 wk	58	7	8.5	(2.0-35.4)	0.003
10 wk	55	25	2.2	(1.1-4.5)	0.031
26 wk	43	25	1.8	(0.8-3.8)	0.14

*Relative Risks are from log binomial models that incorporate all follow-up periods.

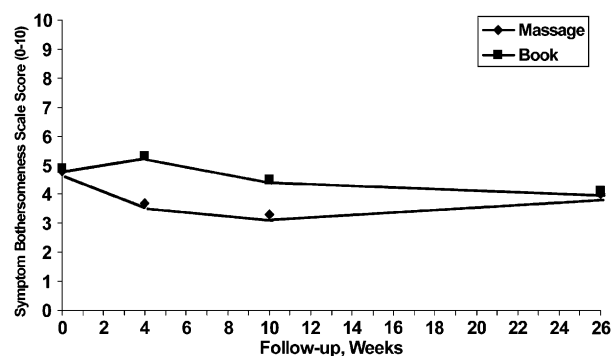


FIGURE 3. Mean symptom bothersomeness scores (0 to 10 points) at baseline, 4, 10, and 26 weeks by treatment group.

follow-up of less than 1 year, and the absence of participants with severe neck pain. Despite these limitations, our data suggest that therapeutic massage is helpful in relieving neck pain and dysfunction for a substantial fraction of individuals, at least in the short term. Because some of the exclusion criteria for this study (eg, exclusion of participants with cervical radiculopathy, prior neck surgery, litigation for neck pain, motor vehicle accident within the past 3 months, and currently receiving treatments for neck pain apart from medications) may well have eliminated some people who would seek massage therapy for their neck pain in the community, future studies would be required to evaluate the effectiveness of massage in such individuals.

Future studies should investigate the optimal dose of massage including the number of treatments, the frequency of treatments, and the length of the treatment period and the usefulness of “booster” sessions or self-massaging devices, in extending the time frame for these benefits. Once the treatment is optimized, larger studies should be conducted that include at least 1 year or longer follow-up period and patients with more severe neck pain. Such studies should include multiple outcome measures, including global rating of improvement, which we found to show an important difference between treatment groups at all follow-up interviews.

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