Lower back pain and sleep disturbance are reduced following massage therapy

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**Summary** A randomized between-groups design was used to evaluate massage therapy versus relaxation therapy effects on chronic low back pain. Treatment effects were evaluated for reducing pain, depression, anxiety and sleep disturbances, for improving trunk range of motion (ROM) and for reducing job absenteeism and increasing job productivity. Thirty adults (M age = 41 years) with low back pain with a duration of at least 6 months participated in the study. The groups did not differ on age, socioeconomic status, ethnicity or gender. Sessions were 30 min long twice a week for 5 weeks. On the first and last day of the 5-week study participants completed questionnaires and were assessed for ROM. By the end of the study, the massage therapy group, as compared to the relaxation group, reported experiencing less pain, depression, anxiety and sleep disturbance. They also showed improved trunk and pain flexion performance.

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**Introduction**

Back pain is the second leading chronic pain condition for physician visits, and the morbidity associated with back pain is the most frequent cause of work absenteeism (Kaaria et al., 2005).

Psychological variables thought to influence the pain experience include depression, anxiety, sleeplessness, distress and cognitive functioning.

Relaxation therapy has been used for lower back pain (Linton et al., 1985; Nicholas et al., 1992). Massage therapy may effectively treat lower back pain as it has been shown to reduce pain in other painful syndromes. For example, massage therapy has been shown to decrease pain associated with juvenile rheumatoid arthritis (Field et al., 1997a), fibromyalgia (Sunshine et al., 1996),...
chronic fatigue syndrome (Field et al., 1997b) and migraine headaches (Hernandez-Reif et al., 1998). Moreover, massage therapy has also been shown to reduce anxiety and depression (Field et al., 1992).

In a recent study comparing massage therapy and relaxation therapy effects on lower back pain, trunk and pain flexion performance were improved by massage therapy and self-reported pain depression, anxiety and sleep disturbance were decreased (Hernandez-Reif et al., 2001). In addition, dopamine and serotonin levels increased following a 5-week period of two 30-min massages per week. The lesser sleep disturbance that accompanied massage therapy could relate to the lesser pain, as sleep disturbances are noted to increase pain and pain-associated substances such as substance P (Field et al., 2004). The present replication study examined massage therapy and relaxation therapy effects for reducing chronic low back pain, depression, anxiety, and sleep disturbance, for improving range of motion (ROM) and finally for reducing job absenteeism and increase productivity, which were not assessed in the previous study.

Method

Participants

The sample included 30 adults (14 women) with low back pain of a duration of at least 6-months. Power analyses based on our previous low back pain study (Hernandez-Reif et al., 2001), suggested that 30 participants would be sufficient to provide for 70% power to detect the effects massage therapy on anxiety, mood, pain, ROM and sleep disturbance. The participants were cleared by their primary physician to participate in the study. Exclusion criteria were back pain due to fractured vertebrae, herniated or degenerated disks, patients who had undergone surgery for their back pain, (i.e. laminectomies or fusions) and patients with sciatic nerve involvement or legal action pending, such as workmen’s compensation. The participants averaged 41 years of age and were middle class ($M = 2.5$ on the Hollingshead Index), were 67% Caucasian, 9% Hispanic, 16% African American and 8% Asian. The groups did not differ on age, socioeconomic status, ethnicity or gender. Participants were randomly assigned to a massage therapy or relaxation therapy group.

Procedures

Massage therapy

The massage group received two 30-min massage therapy sessions per week over 5 weeks by trained massage therapists, who used Biotone Spa Replenishing Light Body Oil (Biotone, San Diego, CA, USA) each session starting with the participant in the prone position, resting the ankles on a small cushion. The massage consisted of the following techniques applied to the entire back: (1) moving the flats of the hands across the back; (2) kneading and pressing the muscles; and (3) short back and forth rubbing movements on the muscles next to the spine and the muscles that attach to the hip bone. The following techniques were administered to the legs: (1) long gliding strokes toward the torso, to the entire leg; (2) kneading and moving the skin in the thigh area; (3) pressing and releasing, and back and forth rubbing movements on the area between the hip and the knee on the back of the thigh; and (4) short rubbing movements to the small muscles around the knees. In the supine position with a bolster under the knee, the participants received: (1) long gliding strokes and kneading of the neck muscles; (2) moving the flats of the hands across the abdomen; (3) pinching and moving the skin on the abdomen in all directions; and (4) kneading with mixed wringing the muscles that bend the trunk forward (rectus and oblique muscles). Then, to the entire leg: (1) stroking; (2) kneading followed by pressing and releasing the anterior thigh region; (3) flexing of the thigh and knee; and (4) pulling of both legs at the same time using direct longitudinal traction.

Relaxation therapy

A relaxation therapy group, which was included to control for potential placebo and increased attention effects, was shown how to use progressive muscle relaxation exercises including tensing and relaxing large muscle groups starting with the feet and progressing to the calves, thighs, hands, arms, back and face. The participants were asked to conduct these 30-min sessions at home twice a week for 5 weeks and to keep a log on the times they spent in relaxation therapy. They were also called weekly to monitor their compliance.

Pre-post session assessments (immediate effects)

The following assessments were made before and after the sessions on the first and last days of the 5-week study. These measures were used to assess stress, pain and ROM.
Low back pain reduced by massage therapy

Profile of Mood States Depression Scale (POMS-D, McNair et al., 1971)
The POMS consists of 19 adjectives rating depressed mood using the words such as “blue”, “sad”, and “lively” on a 5-point scale ranging from “not at all” to “extremely”. The scale has adequate concurrent validity and good internal consistency (r = .95; McNair et al., 1971) and adequate measure of intervention effects (Pugatch, Haskell & McNair, 1969).

State Anxiety Inventory (STAI; Spielberger et al., 1970)
The STAI includes 20 anxiety statements assessing how the participant feels at that moment in terms of severity (not at all to very much so). Characteristic items include “I feel nervous” and “I feel calm.” The STAI scores increase in response to stress and decrease under relaxing conditions (Spielberger et al., 1970). The STAI has adequate concurrent validity and internal consistency (r = .83, Spielberger, 1972).

VITAS (VITAS Healthcare Corporation, 1993)
Present pain was assessed by a Visual analog Scale ranging from 0 (“happy face”) to 10 (“frowning/sad face”), which represented no pain to worst possible pain.

ROM measures
While standing straight with feet placed shoulder width apart in a normal position, the length of the spine was measured using a tape measure. One magic marker mark was made on the skin at the most prominent bone at the base of the neck (cervical vertebra bone 7) and a second mark was made on the skin at the round bony prominence of the backbone (lumbar vertebra 1). The distance between these two marks was recorded in centimeters. A trunk flexion ROM measure (touch toes without pain) was then recorded, again from the base of the neck (cervical vertebra bone 7) to the round bony prominence of the backbone (lumbar vertebra 1), asking the person to reach forward to touch the toes. The trunk flexion measure minus the standing up baseline measure served as the trunk flexion ROM. A pain flexion ROM measure (touch toes to the point of pain) was then obtained, as above, but the person was asked to reach toward the toes or flex the trunk as far as possible, even with pain. This measure was also subtracted from the baseline standing up measure. All physical measurements were collected by MHR who was assessed for reliability prior to the start of the study.

First–last day sessions (longer term effects)
On the first and last day of the 5-week study, the following assessments were conducted.

Sleep Scale (Verran and Snyder-Halperin, 1988)
This visual analog scale is anchored at one end with ineffective sleep responses (e.g., “Did not awaken”, “Had no trouble sleeping”) and at the opposite end with ineffective responses (e.g., “Was awake 10 h”, “Had a lot of trouble falling asleep”). The participants were asked to place a mark across the answer line at the point that best reflected their last night’s sleep. The scale yields subcategories of sleep disturbance score. A reliability coefficient of .82 has been reported for this scale (Snyder-Halpern and Verran, 1987).

Job productivity and absenteeism
Participants were asked how many days they missed at work and to rate their level of job productivity on a scale of 0 (not at all productive) to 5 (very productive) for the first and last week of the study.

Results
Repeated measures ANOVAs were conducted to determine the effects of massage therapy versus relaxation therapy on lower back pain. The repeated measures were pre and post therapy sessions and first and last days of the study. Significant interaction effects were followed by Bonferroni t-tests.

Group by pre–post session and group by pre–post session by day interaction effects were revealed for the massage group benefits for mood and for pain. Post Bonferroni t-tests indicated the following (see Table 1): (1) mood as assessed by the POMS improved following the first session (t = 2.92, p < .009; η² = .31) and by the end of the study (t = 2.02, P < .05; η² = .18) and (2) pain as reported on the VITAS decreased following each session (t = 4.98, P < .001; η² = .55 for the first session and t = 6.01, P < .001; η² = .64 for the second session) and by the end of the study (t = 2.29, P < .03; η² = .22).

Group by pre/post session interaction effects (see Table 1) and Post Bonferroni t-tests revealed the following: (1) state anxiety decreased for the massage group on both days (t = 4.52, P < .001;
$\eta^2 = .51$ for the first day and $t = 4.34, P < .001$; $\eta^2 = .48$ for the last day); (2) trunk flexion increased for the massage group on both days ($t = 5.18, P < .001$; $\eta^2 = .57$ for the first day and $t = 2.60, P < .02$; $\eta^2 = .62$ for the last day); and (3) trunk flexion with pain increased for the massage group on both days ($t = 4.21, P < .001$; $\eta^2 = .47$ for the first day and $t = 4.53, P < .001$; $\eta^2 = .52$ for the last day). A group by day interaction effect yielded a decrease in sleep disturbance for the massage therapy group across the study ($t = 2.72, P < .01$; $\eta^2 = .29$). No changes were noted for the job productivity or absenteeism measures.

### Discussion

After the first session, the massage participants reported less depressed mood, as they did across the study. After the first and last massage therapy session, they were less anxious. Similarly, pain was lessened after the first and last sessions and over the course of the study for the massage therapy group. These findings concur with other massage studies on depressive pain syndromes including fibromyalgia (Sunshine et al., 1996) and chronic fatigue syndrome (Field et al., 1997b) and suggest that massage therapy is more effective than relaxation therapy for reducing pain and anxiety, and for improving mood.

The massage therapy group also experienced an immediate increase in the measures of trunk flexion with and without pain after the first and last sessions as they had in our previous massage therapy study on individuals with lower back pain (Hernandez-Reif et al., 2001). Increased ROM has been correlated with significant pain reduction following physical therapy (Mooney et al., 1996). Finally, another effect for the massage therapy group was less disturbed sleep by the end of the study. Similar findings were reported for lower back pain by Hernandez-Reif et al. (2001) and for other pain syndromes following massage (Field et al., 1997a; Sunshine et al., 1996). Sleep recordings and biochemical assays of substance P might indicate whether the lower back pain is related to less restorative sleep and the resultant release of substance P, as has been noted for other pain syndromes such as fibromyalgia (Field et al., 2002).

Although massage therapy was also expected to increase job productivity and reduce absenteeism for individuals with chronic low back problems, these measures were not affected by massage therapy in this sample. The lack of effects on job productivity and absenteeism may relate to the virtual absence of these problems at baseline. The sample of individuals working at the medical school

### Table 1

Means (and standard deviations under means, in italics) for pre/post session measures for the first and last days for the massage and relaxation groups.

<table>
<thead>
<tr>
<th>Measures</th>
<th>Massage therapy</th>
<th>Relaxation</th>
<th>Massage therapy</th>
<th>Relaxation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre Post</td>
<td>Pre Post</td>
<td>Pre Post</td>
<td>Pre Post</td>
</tr>
<tr>
<td>Mood (POMS)</td>
<td>10.0 $a$</td>
<td>4.15 $b$</td>
<td>5.7 $a$</td>
<td>4.9 $a$</td>
</tr>
<tr>
<td>Anxiety (STAI)</td>
<td>36.5 $a$</td>
<td>25.8 $b$</td>
<td>33.9 $a$</td>
<td>26.9 $b$</td>
</tr>
<tr>
<td>Pain (VITAS)</td>
<td>5.1 $a$</td>
<td>2.7 $b$</td>
<td>3.9 $a$</td>
<td>1.4 $b$</td>
</tr>
<tr>
<td>Trunk flexion (cm)*</td>
<td>58.9 $a$</td>
<td>62.1 $b$</td>
<td>60.6 $a$</td>
<td>61.9 $b$</td>
</tr>
<tr>
<td>(touch toes without pain)</td>
<td>7.5 $a$</td>
<td>8.7 $b$</td>
<td>8.4 $a$</td>
<td>8.0 $b$</td>
</tr>
<tr>
<td>Pain flexion (cm)*</td>
<td>61.6 $a$</td>
<td>63.6 $b$</td>
<td>62.4 $a$</td>
<td>63.5 $b$</td>
</tr>
<tr>
<td>(touch toes with pain)</td>
<td>8.1 $a$</td>
<td>8.8 $b$</td>
<td>8.1 $a$</td>
<td>8.1 $b$</td>
</tr>
<tr>
<td>Sleep disturbance</td>
<td>40.5 $a$</td>
<td>26.1 $b$</td>
<td>31.8 $ab$</td>
<td>29.6 $ab$</td>
</tr>
</tbody>
</table>

*Higher score is optimal. All other measures, lower score is optimal. Different letter subscripts indicate different means. Number superscripts indicate levels of significance $^1P = .05, ^2P = .01, ^3P = .0001$ for the pre-post session effects and letter subscripts indicate levels of significance ($^aP = .05, ^bP = .01$) for the pre session first day versus last day effects.
may have felt that being present and productive was critical to their jobs despite lower back pain. One limitation of the study was ensuring that the control participants actually practiced muscle relaxation. A future study might have the relaxation participants attend sessions at the clinic to ensure compliance. Another limitation of the study was the small sample size and lack of a long-term follow-up assessment. These data, nonetheless, suggest that massage therapy effectively reduces pain, sleep disturbances and the anxiety and depressed mood states associated with lower back pain.

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