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SPINAL CORD PATIENTS BENEFIT FROM MASSAGE THERAPY

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The present study assessed the effects of massage therapy on depression, functionality, upper body muscle strength and range of motion on spinal cord injury patients. Twenty C5 through C7 spinal cord injury individuals recruited from a University outpatient clinic were randomly assigned to a massage therapy group or an exercise group. Patients in the massage therapy group received two 40-min massage therapy sessions per week for 5 weeks. Patients in the control group practiced a range of motion exercise routine targeting the arms, neck, shoulders, and back 2 times per week for 5 weeks. Although both the massage and exercise group appeared to benefit from treatment, only the massage group showed lower anxiety and depression scores and significantly increased their muscle strength and wrist range of motion.

Keywords massage therapy, spinal cord injury

Traditional rehabilitation for spinal cord injury (SCI) consists largely of physical therapy. This treatment, usually provided on an inpatient basis by occupational or physical therapists, includes exercises designed to strengthen the upper extremities and to maximize independence in self-care, transfer, mat mobility, and wheelchair use. Rehabilitation is initiated as soon as the patient is medically and physically stable, and is terminated when the patient reaches a plateau in functional gains.

Long-term care for SCI is generally limited to medical follow-up (Klose et al., 1990). Rehabilitation is generally not provided following discharge, although scores on the Modified Barthel Index (MBl) (Mahoney & Barthel, 1965), which measures self-care and mobility, have improved over a three-year period (Yarkoni, Roth, Heinman, Katz, & Lovell, 1987; Yarkoni, Roth, Heinman, Lovell, & Wu, 1988). SCI patients seem to continue to benefit from physical therapy, neuromuscular stimulation, and EMG biofeedback, as indicated on manual muscle tests, self-care scores, mobility measures, and voluntary EMG activity (Klose et al., 1990; Klose, Needham, Schmidt, Broton, & Green, 1996). In addition, biofeedback techniques, including operant conditioning, have been associated with increased voluntary EMG responses (Brucker & Bulaeva, 1996) and functional electrical stimulation (FES) has been used for recovery of function by reducing fatigue and atrophy of paralyzed muscles (Mao, 1994).

The present study assessed massage therapy and exercise effects on C5–C7 spinal cord injury patients. The massage therapy was designed to increase upper body muscle strength and range of motion and improve functionality. Massage therapy has been shown to increase range of motion and reduce pain in lower back pain patients (in review) (Hernandez-Reif, Field, Krasnegor, & Theakston, 2001) and in dancers (Leivadi et al., 1999), as well as reduce stiffness, pain, and fatigue in patients with fibromyalgia (Sunshine et al., 1996). In addition, massage therapy may reduce the anxiety and depression noted in SCI patients (Craig, Hancock, Dickson, & Chang, 1997; Elliot & Frank, 1996; Field, 1998). Massage therapy has decreased self-reports of anxiety and depression, and has decreased stress hormones (cortisol and norepinephrine) and increased serotonin levels in adults (Field, 1998; Hernandez-Reif, Dieter, Field, Swerdlow, & Diego, 1998). The exercise routine, although to a lesser degree, was also expected to improve muscle strength, range of motion and functionality, and decrease depression and anxiety scores. Exercise has been associated with both physiological and psychological improvements in chronic SCI patients. For example, exercise has been associated with improved quality of life scores, cardiovascular, respiratory, and muscular activity (Noreau & Shephard, 1995).

METHODS AND MATERIALS

Subjects

The sample consisted of males (n = 15) and females (n = 5) of middle socioeconomic status (M = 2.7 on the Hollingshead) with a mean age of 39 years (SD = 12.2). They were distributed 75% Caucasian, 15% African American, and 10% Hispanic. The participants' injuries ranged from C5–C7.

Design

Only those who had C5–C7 spinal cord injuries for at least one year were recruited for this study. The study volunteers were first

stratified on range of motion and then randomly assigned to either a massage therapy or exercise group. Prior to group assignment (and on the last day of therapy), a physiotherapist (who was blind to the participants' group assignment) assessed their range of motion and muscle strength and administered the Modified Barthel Index. On the first and last days of treatment, the participants also completed the CES-D for depression (Radloff, 1977). Finally pre- and post-treatment on the first and last days they completed the STAI to assess anxiety (Spielberger, Gorsuch, & Lushene, 1970).

Interventions

Massage Therapy

The massage therapy group received a 40-min massage therapy session twice per week for 5 weeks by trained massage therapists. After being transferred to a massage table, participants were massaged according to the following sequence: ARMS: 1) moderate pressure and long smooth stroking along the length of each arm; 2) slow stroking with moderate pressure to the muscle attachments at bony landmarks of arms and shoulders; 3) lifting and pulling of the skin along the length of both arms; 4) kneading from shoulder to fingers; 5) applying moderate pressure with both thumbs to spastic areas; 6) carefully stretching the shoulder, elbow, wrist, and finger joints. TRUNK: 1) moderate pressure, long strokes along the length of the back; 2) stroking with moderate pressure to the muscle attachments at bony landmarks of the back; 3) lifting and pulling of the skin along the length of both sides of the spine; 4) kneading the muscles; 5) applying moderate pressure with both thumbs to spastic areas; 6) stretching the back muscles and shoulders; and 7) stroking along the entire back and arms.

Exercise Treatment

The exercise group was taught an exercise routine that they performed 2 times per week for 5 weeks on their own. The procedure consisted of slowly repeating the following movements five times (one minute each): 1) slowly moving chin to chest and back;

2) tilting head to each shoulder; 3) with arms by the side raising each shoulder; 4) raising each arm parallel to ground as high as possible; 5) extending both arms away from the body at shoulder level and then pulling them back keeping them raised at shoulder level; and 6) interlocking fingers of both hands and then raising both arms, extended, to shoulder level, and then rounding shoulders first in clockwise and then in counterclockwise directions. The participants were asked to recall each time they conducted this exercise treatment.

Short-Term Assessments

State Anxiety Inventory (STAI) (Spielberger et al., 1970) is a 20-item scale that measures the transitory anxiety levels in terms of severity, with 1 representing "not so much" and 4 representing "very much." Characteristic items include "l feel tense" and "l feel relaxed." The STAI has adequate concurrent validity and internal consistency (r = .83) (Spielberger et al., 1970). In addition, the STAI scores increase in response to situational stress and decline under relaxing conditions. A summary score is obtained by adding the weight of each item. Based on other massage and relaxation studies, STAI scores were expected to decrease following massage therapy (Field et al., 1996; Hernandez-Reif et al., 1998).

Longer Term Assessments

Center for Epidemiological Studies-Depression scale (CES-D) (Radloff, 1977) is a 20-item questionnaire, with possible scores ranging between 0 and 60. The respondents rate the frequency (within the last week) of 20 symptoms. Symptoms include depressed mood, feelings of helplessness and hopelessness, feelings of guilt and worthlessness, loss of energy, and problems with sleep and appetite. Studies have shown that a score of 16 or greater can differentiate clinically depressed and nondepressed subjects with only a 6% false-positive and 36% false-negative rate (Radloff, 1977). In addition, this scale has been shown to be reliable and valid for diverse demographic groups (Radloff, 1977).

Manual Muscle Test was used to assess upper limb muscle strength.

The Manual Muscle Test was developed to assess motor function after spinal cord injury (Klose et al., 1992). Scores for the Manual Muscle Test are as follows: 0 (zero) = no palpable or observable muscle contraction; 1 (trace) = evidence of muscle contraction, no ability to move through the full range of motion (ROM); 2 (poor) = ability to move through the full available ROM (gravity eliminated); 3 (fair) = ability to move through the full available ROM (against gravity); 4 (good) = ability to move through the full available ROM against moderate resistance; and 5 (normal) = ability to move through the full available ROM against maximal resistance. Only measures for those muscles being directly treated were taken and their values averaged to yield a summary score. The range for the mean score of the 14 items corresponding to shoulders, arms, and wrists was 0 to 5, with a higher rating being optimal.

Modified Barthel Index (MBI) is a scale designed to assess 14 self-care and mobility skills, including wheelchair propulsion, stair climbing, walking, tub transfers, toilet transfers, chair transfers, bowel continence, bladder continence, grooming, upper body dressing, lower body dressing, feeding from a dish, and feeding from a cup. The MBI has been shown to be a reliable and sensitive scale for recording change in the functioning of individuals with spinal cord injury (Mahoney & Barthel, 1965; Yarkoni et al., 1988).

Range of Motion for abduction (shoulders only), extension, and flexion of the shoulders, elbows, and wrists were assessed by a physical therapist. Range of motion was assessed by placing a goniometer on the axis of the joint and having the therapist help the subject move the extremity through its active range of motion. The greatest angle of motion was then noted in degrees. Range of motion figures for each joint were then averaged for each upper limb yielding 7 scores.

RESULTS

Short-Term Assessments (pre-posttreatment sessions)

A group (massage vs. exercise) by time (pre-post) by day (first day/last day) repeated measures ANOVA revealed a group by time (pre-

post) interaction effect on STAI scores $F(1,18) = 14.51$, $p < .01$. Subsequent Bonferroni *t*-tests (Table 1) suggested that the massage group had significantly lower anxiety scores immediately after treatment on the first ($t[9] = 5.05$, $p < .01$) and last ($t[9] = 4.93$, $p < .01$) days.

Longer Term Assessments (first day vs. last day assessment)

CES-D

A group (massage vs. exercise) by day (first day/last day) repeated measures ANOVA (Table 1) revealed a group by day interaction effect $F(1,18) = 5.05$, $p < .05$. Subsequent post hoc Bonferroni *t*-tests revealed a greater decrease in CES-D depression scores for the massage therapy group ($t[9] = 2.30$, $p = <.05$).

Manual Muscle Test

A group (massage vs. exercise) by day (first day/last day) repeated measures ANOVA revealed a group by day interaction effect $F(1,18) = 4.88$, $p < .05$. Subsequent Bonferoni *t*-tests (Table 1) suggested that the massage group showed a greater improvement in muscle strength ($t[9] = 2.62$, $p = <.05$).

Range of Motion

Group (massage vs. exercise) by day (first day/last day) repeated measures ANOVAs (Table 1) revealed the following: 1) a significant trial effect $F(1,18) = 5.08$, $p < .05$, indicated that both groups improved in shoulder abduction; 2) a significant group by day interaction effect $F(1,18) = 4.75$, $p < .05$, and subsequent Bonferroni *t*-tests indicating that the massage group ($t[9] = 4.27$, $p < .01$) showed greater improvement in wrist extension; and 3) a significant group by day interaction effect $F(1,18) = 4.48$, $p < .05$, and subsequent Bonferroni *t*-tests indicating that the massage group ($t[9] = 2.98$, $p < .05$) showed greater improvement in wrist flexion.

TABLE 1. Means and SDs (in parentheses)*†

	Massage		*Exercise*	
	First day	*Last day*	*First day*	*Last day*
	Pre/post	*Pre/post*	*Pre/post*	*Pre/post*
STAI	34.20 (8.2)$_a$ 25.70 (7.3)$_b$	31.60 (7.1)$_a$ 24.40 (5.3)$_b$	31.90 (6.6)$_a$ 29.20 (8.0)$_a$	31.50 (8.3)$_a$ 29.20 (7.9)$_a$
CES-D	15.90 (12.9)$_a$	11.4 (12.1)$_b$	14.8 (9.9)$_a$	15.10 (10.6)$_a$
Muscle strength	4.60 (0.7)$_a$	4.80 (0.7)$_b$	4.60 (0.9)$_a$	4.70 (0.9)$_a$
MBI	2.80 (0.8)$_a$	2.90 (1.0)$_a$	2.90 (0.8)$_a$	2.80 (1.1)$_a$
ROM				
Shoulder				
Abduction	125.30 (26.9)$_a$	143.70 (29.8)$_b$	134.40 (21.8)$_a$	141.60 (16.9)$_b$
Flexion	56.40 (17.6)$_a$	67.80 (18.3)$_a$	69.90 (17.0)$_a$	69.10 (21.5)$_a$
Extension	137.00 (33.9)$_a$	149.50 (33.6)$_a$	154.70 (20.5)$_a$	152.20 (16.35)$_a$
Elbow				
Flexion	123.50 (28.9)$_a$	135.10 (8.4)$_a$	132.70 (13.2)$_a$	134.70 (10.4)$_a$
Extension	72.25 (59.7)$_a$	83.60 (61.8)$_a$	92.20 (64.9)$_a$	80.70 (50.4)$_a$
Wrist				
Flexion	63.25 (16.7)$_a$	69.50 (13.3)$_b$	66.50 (17.5)$_{ab}$	66.85 (15.3)$_{ab}$
Extension	59.80 (19.6)$_a$	66.50 (19.5)$_b$	67.40 (13.7)$_b$	69.01 (15.7)$_b$

*Subscripts a and b indicate differences.
†Higher is optimal.

DISCUSSION

The spinal cord injury participants who received massage therapy twice a week for 5 weeks showed greater improvement in muscle strength and fine motor (wrist) range of motion than the exercise group. This increased muscle strength and range of motion may have contributed to the decrease in their depression and anxiety. These changes in psychological state support previous research showing that massage therapy can decrease depression and anxiety (Field, 1998; Hernandez-Reif et al., 1999; Sunshine et al., 1996). Depression is common among patients with spinal cord injury, and is detrimental to their quality of life (Noreau & Shephard, 1995).

These data suggest that patients with spinal cord injury can benefit from massage therapy. Future studies could assess massage therapy on other spinal cord injury problems, including spasticity and pain. Further, other studies are needed to evaluate the effects of massage therapy on the lower extremities of C5–C7 spinal cord injury patients as a means of increasing circulation and minimizing muscle atrophy.

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