

Message



Aggression

Diego, M.A., Field, T., Hernandez-Reif, M., Shaw, J.A., Rothe, E.M., Castellanos, D. & Mesner, L. (2002). Aggressive adolescents benefit from massage therapy. *Adolescence*, 37, 597-607.

METHODS: Seventeen aggressive adolescents were randomly assigned to a massage therapy group or a relaxation therapy group to receive 20-minute therapy sessions, twice a week for five weeks.

RESULTS: The massaged adolescents had lower anxiety after the first and last sessions. By the end of the study, they also reported feeling less hostile and they were perceived by their parents as being less aggressive. Significant differences were not found for the adolescents who were assigned to the relaxation group.

Alzheimer's

Rowe, M. & Alfred, D. (1999). The effectiveness of slow-stroke massage in diffusing agitated behaviors in individuals with Alzheimer's disease. *Journal of Gerontology and Nursing*, 25, 22-34.

METHODS: Agitated behaviors of individuals with Alzheimer's disease (AD), often endured or unsuccessfully treated with chemical or physical restraints, markedly increase the stress levels of family caregivers. The Theoretical Model for Aggression in the Cognitively Impaired guided the examination of caregiver-provided slow-stroke massage on the diffusion of actual and potential agitation for community-dwelling individuals with AD. Characteristics and frequency of agitation were quantified by two highly correlated instruments, the Agitated Behavior Rating Scale Scoring Guide and the Brief Behavior Symptom Rating Scale. **RESULTS:** Expressions of agitation of patients with AD increased in a linear pattern from dawn to dusk. Verbal displays of agitation, the most frequently cited form of agitation in community-dwelling individuals with AD, were not diffused by slow-stroke massage. However, more physical expressions of agitation such as pacing, wandering, and resisting were decreased when slow-stroke massage was applied.

Anorexia

Hart, S., Field, T. & Hernandez-Reif, M., Nearing, G., Shaw, S., Schanberg, S., & Kuhn, C. (2001). Anorexia nervosa symptoms are reduced by massage therapy. *Eating Disorders, 9, 289-299.*
METHODS: Women diagnosed with anorexia nervosa were given a massage twice per week for five weeks or standard treatment. **RESULTS:** The massaged women reported lower stress and anxiety levels and showed lower cortisol levels immediately following the massage. Over the five-week treatment period, they also reported decreased body dissatisfaction on the Eating Disorder Inventory and showed increased dopamine and norepinephrine levels.

Anxiety

Bauer, B.A., Cutshall, S.M., Wentworth, L.J., Engen, D., Messner, P.K., Wood, C.M., Brekke, K.M., Kelly, R.F. & Sundt III, T.M. (2010). Effects of massage therapy on pain, anxiety, and tension after cardiac surgery: a randomized study. *Complementary Therapies in Clinical Practice, 16, 70-75.*
METHODS: Cardiac surgery patients were randomized to receive a massage or to have quiet relaxation time on postoperative day 2 (the day after surgery) and day 4. **RESULTS:** Patients receiving massage therapy had decreased pain, anxiety, and tension.

Cutshall, S.M., Wentworth, L.J., Engen, D., Sundt, T.M., Kelly, R.F. & Bauer, B.A. (2010). Effects of massage therapy on pain, anxiety, and tension in cardiac surgical patients: a pilot study. *Complementary Therapies in Clinical Practice, 16, 92-95.*
METHODS: Cardiac surgery patients were randomized to receive a massage or to have quiet relaxation time on postoperative day 2 (the day after surgery) and day 4. **RESULTS:** Patients receiving massage therapy had decreased pain, anxiety, and tension.

Field, T., Morrow, C., Valdeon, C., Larson, S., Kuhn, C. & Schanberg, S. (1992). Massage reduces anxiety in child and adolescent psychiatric patients. *Journal of the American Academy of Child and Adolescent Psychiatry, 31, 125-131.*
METHODS: A 30-minute back massage was given daily for a 5-day period to 52 hospitalized depressed and adjustment disorder children and adolescents. **RESULTS:** Compared with a control group who viewed relaxing videotapes, the massage subjects were less depressed and anxious and had lower saliva cortisol levels after the massage. In addition, nurses rated the subjects as being less anxious and more cooperative on the last day of the study, and nighttime sleep increased over this period. Finally, urinary cortisol and norepinephrine levels decreased, but only for the depressed subjects.

Shulman, K.R. & Jones, G.E. (1996). The effectiveness of massage therapy intervention on reducing anxiety in the work place. *Journal of Applied Behavioral Science, 32, 160-173.*
METHODS: An on-site chair massage therapy program was provided to reduce anxiety levels of 18 employees in a downsizing organization. 15 control group Ss participated in break therapy. Subjects' stress levels were measured with the State-Trait Anxiety Inventory, which was administered twice during pretest, post test, and delayed post test to achieve stable measures. **RESULTS:**

Significant reductions in anxiety levels were found for the massage group.

Arthritis

Field, T., Hernandez-Reif, M., Seligman, S., Krasnegor, J. & Sunshine, W. (1997). Juvenile rheumatoid arthritis: Benefits from massage therapy. *Journal of Pediatric Psychology, 22, 607-617.*
METHODS: Children with mild to moderate juvenile rheumatoid arthritis were massaged by their parents 15 minutes a day for 30 days (and a control group engaged in relaxation therapy). **RESULTS:** The children's anxiety and stress hormone (cortisol) levels were immediately decreased by the massage, and over the 30-day period their pain decreased on self-reports, parent reports, and their physician's assessment of pain (both the incidence and severity) and pain-limiting activities.

Yurtkuran, M. & Kocagil, T. (1999). TENS, electropuncture and ice massage: Comparison of treatment for osteoarthritis of the knee. *American Journal of Acupuncture, 27, 133-140.*

METHODS: The purpose of this study was to compare the effectiveness of transcutaneous electrical nerve stimulation (TENS), electroacupuncture (EA), and ice massage with placebo treatment for the treatment of pain. Subjects (n = 100) diagnosed with osteoarthritis (OA) of the knee were treated with these modalities. The parameters for evaluating the effectiveness of treatment included pain at rest, stiffness, 50 foot walking time, quadriceps muscle strength, and knee flexion degree. **RESULTS:** The results showed (a) that all three methods could be effective in decreasing not only pain but also the objective parameters in a short period of time; and (b) that the treatment results in TENS, EA and ice massage were superior to placebo.

Perlman, A.I., Sabina, A., Williams, A.L., Njike, V.Y., & Katz, D.L. (2006). Massage therapy for osteoarthritis of the knee: a randomized controlled trial. *Archives of Internal Medicine, 166, 2533-2538.*

METHODS: Adults with Osteoarthritis of the knee were assigned either to treatment (twice-weekly sessions of Swedish massage in weeks 1-4 and once-weekly sessions in weeks 5-8) or to control (delayed intervention). **RESULTS:** The group receiving massage therapy improved pain, stiffness and physical function domains and in range of motion in degrees, and time to walk 50 ft.

Field, T., Diego, M., Hernandez-Reif, M., Shea, J. (2007). Hand arthritis pain reduced by massage therapy. *Journal of Bodywork and Movement Therapies, 2, 21-24.*

METHODS: Twenty-two adults with wrist/hand arthritis were randomly assigned to a massage therapy or a standard treatment control group. The massage therapy group was massaged on the affected wrist/hand once a week for a 4-week period and were also taught self-massage on the wrist/hand that was to be done daily at home. **RESULTS:** The massage therapy group versus the control group had lower anxiety and depressed mood scores after the first and last sessions, and that group reported less pain and greater grip strength after their sessions. The massage therapy group showed greater improvement than the control group on all of these measures across the study period.

Asthma



Field, T., Henteleff, T., Hernandez-Reif, M., Martinez, E., Mavunda, K., Kuhn, C. & Schanberg, S. (1998). Children with asthma have improved pulmonary functions after massage therapy. *Journal of Pediatrics*, 132, 854-858.

METHODS: Thirty-two children with asthma (16 4- to 8-year-olds and 16 9- to 14-year-olds) were randomly assigned to receive either massage therapy or relaxation therapy. The children's parents were taught to provide one therapy or the other for 20 minutes before bedtime each night for 30 days. **RESULTS:** The younger children who received massage therapy showed an immediate decrease in behavioral anxiety and cortisol levels after massage. Also, their attitude toward asthma and their peak air flow and other pulmonary functions improved over the course of the study. The older children who received massage therapy reported lower anxiety after the massage. Their attitude toward asthma also improved over the study, but only one measure of pulmonary function (forced expiratory flow 25% to 75%) improved. The reason for the smaller therapeutic benefit in the older children is unknown; however, it appears that daily massage improves airway caliber and control of asthma.

Attention Deficit Hyperactivity Disorder

Field, T., Quintino, O., Hernandez-Reif, M. & Koslovsky, G. (1998). Adolescents with attention deficit hyperactivity disorder benefit from massage therapy. *Adolescence*, 33, 103-108.

METHODS: Twenty-eight adolescents with attention deficit hyperactivity disorder were provided either massage therapy or relaxation therapy for 10 consecutive school days. **RESULTS:** The massage therapy group, but not the relaxation therapy group, rated themselves as happier and observers rated them as fidgeting less following the sessions. After the 2-week period, their teachers reported more time on task and assigned them lower hyperactivity scores based on classroom behavior.

Khilnani, S., Field, T., Hernandez-Reif, M., & Schanberg, S. (2003). Massage therapy improves mood and behavior of students with attention-deficit/hyperactivity disorder. *Adolescence, 38, 623-638.*

METHODS: The present study involved 30 children and adolescents between the ages of 7 and 18 (M = 13) diagnosed with attention-deficit/hyperactivity disorder (ADHD). The children were randomly assigned to a wait-list control and a massage group. The latter group received massage therapy for 20 minutes twice per week over the course of one month. **RESULTS:** Mood state improved for the massage but not the control group based on smiley face and thermometer scales. The massage group also improved in classroom behavior in the areas of the Conners Teacher Rating Scales on anxiety, daydreaming and hyperactivity. The wait-list control group did not show these gains. In sum, the results revealed that massage therapy benefited children and adolescents with ADHD by improving short-term mood state and longer-term classroom behavior.

Autism

Field, T., Lasko, D., Mundy, P., Henteleff, T., Talpins, S., & Dowling, M. (1986). Autistic children's attentiveness and responsivity improved after touch therapy. *Journal of Autism and Developmental Disorders, 27, 329-334.*

METHODS: This study investigated the effects of touch therapy on three problems commonly associated with autism including inattentiveness (off-task behavior), touch aversion, and withdrawal. **RESULTS:** Results showed that touch aversion decreased in both the touch therapy and the touch control group, off task behavior decreased in both groups, orienting to irrelevant sounds decreased in both groups, but significantly more in the touch therapy group, and stereotypic behaviors decreased in both groups but significantly more in the touch therapy group.

Escalona, A., Field, T., Singer-Strunk, R., Cullen, C., & Hartshorn, K. (2001). Improvements in the behavior of children with autism. *Journal of Autism and Developmental Disorders, 31, 513-516.*

METHODS: Twenty children with autism ranging in age from 3 to 6 years were randomly assigned to massage therapy and reading attention control groups. Parents in the massage therapy group were trained by a massage therapist to massage their children for 15 minutes prior to bedtime every night for one month while the parents of the attention control group read Dr. Seuss stories to their children on the same time schedule. Conners Teacher and Parent scales, classroom and playground observations and sleep diaries were used to assess the effects of therapy on various behaviors including hyperactivity, stereotypical and off-task behavior, as well as sleep problems. **RESULTS:** Results suggested that the children in the massage group exhibited less stereotypic behavior and showed more on-task and social relatedness behavior during play observations at school, and they experienced fewer sleep problems at home.

Piravej, K., Tangtrongchitr, P., Chandarasiri, P., Paothong, L. & Sukprasong, S. (2009). Effects of Thai traditional massage on autistic children's behavior. *Journal of Alternative and Complementary Medicine, 15, 1355-1361.*

METHODS: Autistic children received standard sensory integration therapy (SI) or SI with Thai Traditional Massage over a period of 8 weeks. **RESULTS:** Fewer conduct problems and less anxiety were found in the massage group.

Back Pain

Ginsberg, F. and Famaey, J. P. (1987). A double-blind study of topical massage with Rado-Salil ointment in mechanical low-back pain. *Journal of International Medical Research, 15, 148-153.*

METHODS: Forty patients with acute mechanical low-back pain were treated in a double-blind manner with either Rado-Salil or placebo for 14 days. **RESULTS:** Statistically significant improvements in spontaneous pain, muscular contracture and in both the patient's and physician's opinions occurred by day 3. These improvements persisted at day 14 and, in addition, there were statistically significant improvements in the finger-floor distance and the degree of lumbar extension. Treatment with Rado-Salil also allowed significant reduction in the use of oral analgesics. Only a few localized transient side-effects, requiring no specific treatment, were observed.

Pope, M. H., Phillips, R. B., Haugh, L. D., Hsieh, C. Y., MacDonald, L., and Haldeman, S. (1994).

A prospective randomized three-week trial of spinal manipulation, transcutaneous muscle stimulation, massage and corset in the treatment of subacute low back pain. *Spine, 19, 2571-2577.*

METHODS: A randomized prospective trial of manipulation, massage, corset and transcutaneous muscle stimulation (TMS) was conducted in patients with subacute low back pain. The authors determined the relative efficacy of chiropractic treatment to massage, corset, and TMS. Patients were enrolled for a period of 3 weeks. They were evaluated once a week by questionnaires, visual analog scale, range of motion, maximum voluntary extension effort, straight leg raising and a fatigue test. **RESULTS:** After 3 weeks, the manipulation group scored the greatest improvements in flexion and pain while the massage group had the best extension effort and fatigue time, and the muscle stimulation group the best extension.

Ernst, E. (1999). Massage therapy for low back pain: a systematic review. *Journal of Pain Symptom Management, 17, 65-69.*

Massage therapy is frequently employed for low back pain. The aim of this systematic review was to find the evidence for or against its efficacy in this indication. Four random clinical trials were located in which massage was tested as a monotherapy for low back pain. All were burdened with major methodological flaws. One of these studies suggests that massage is superior to no treatment. Two trials imply that it is equally effective as spinal manipulation or transcutaneous electrical stimulation. One study suggests that it is less effective than spinal manipulation. It is concluded that too few trials of massage therapy exist for a reliable evaluation of its efficacy. Massage seems to have some potential as a therapy for low back pain.

Degan, M., Fabris, F., Vanin, F., Bevilacqua, M., Genova, V., Mazzucco, M. & Negrisol, A. (2000). The effectiveness of foot reflexotherapy on chronic pain associated with a herniated disk. *Professioni Infermieristiche*, 53, 80-87.

METHODS: A group of 40 persons suffering almost exclusively from a lumbar-sacral disc hernia received three treatments of reflexology massage for a week. **RESULTS:** sixty-three percent of the group reported a reduction in pain.

Kolich, M., Taboun, S.M., & Mohamed, AI. (2000). Low back muscle activity in an automobile seat with a lumbar massage system. *International Journal of Occupational Safety & Ergonomics*, 6, 113-128.

METHODS: This investigation was conducted to determine the effects of a massaging lumbar support system on low back muscle activity. The apparatus was a luxury-level automobile seat massage. The dependent variable was the change in the EMG signal. **RESULTS:** One minute of lumbar massage every five minutes was found to have a beneficial effect on low back muscle activity as compared to no massage.

Preyde, M. (2000). Effectiveness of massage therapy for subacute low-back pain: a randomized controlled trial. *CMAJ*, 162, 1815-1820.

METHODS: This randomized controlled trial compared comprehensive massage therapy (soft-tissue manipulation, remedial exercise and posture education), 2 components of massage therapy and placebo in the treatment of subacute (between 1 week and 8 months) low-back pain. Subjects with subacute low-back pain were randomly assigned to 1 of 4 groups: comprehensive massage therapy, soft-tissue manipulation only, remedial exercise with posture education only or a placebo of sham laser therapy. Each subject received 6 treatments within approximately 1 month. Outcome measures obtained at baseline, after treatment and at 1-month follow-up consisted of the Roland Disability Questionnaire (RDQ), the McGill Pain Questionnaire (PPI and PRI), the State Anxiety Index and the Modified Schober test (lumbar range of motion). **RESULTS:** The comprehensive massage therapy group had improved function, less intense pain and a decrease in the quality of pain compared with the other 3 groups. At 1-month follow-up 63% of subjects in the comprehensive massage therapy group reported no pain as compared with 27% of the soft-tissue manipulation group, 14% of the remedial exercise group and 0% of the sham laser therapy group.

Cherkin, D.C., Eisenberg, D., Sherman, K.J., Barlow, W., Kaptchuk, T.J., Street, J. & Deyo, R.A. (2001). Randomized trial comparing traditional Chinese medical acupuncture, therapeutic massage, and self-care education for chronic low back pain. *Archives of Internal Medicine*, 161, 1081-1088.

METHODS: 262 patients who had persistent back pain received Traditional Chinese Medical acupuncture, therapeutic massage, or self-care educational materials for up to 10 massage or acupuncture visits over 10 weeks. **RESULTS:** At 10 weeks, massage was superior to self-care on the symptom scale and the disability scale. Massage was also superior to acupuncture on the disability scale. The massage group used the least medications and had the lowest costs of subsequent care.

Hernandez-Reif, M., Field, T., Krasnegor, J., & Theakston, H. (2001). Lower back pain is reduced

and range of motion increased after massage therapy. *International Journal of Neuroscience*, 106, 131-145.

METHODS: A randomized between-groups design evaluated massage therapy versus relaxation for chronic low back pain. Treatment effects were evaluated for reducing pain, depression, anxiety and stress hormones, and sleeplessness and for improving trunk range of motion associated with chronic low back pain. **RESULTS:** By the end of the study, the massage therapy group, as compared to the relaxation group, reported experiencing less pain, depression, anxiety and improved sleep. They also showed improved trunk and pain flexion performance, and their serotonin and dopamine levels were higher.

Kalauokalani, D., Cherkin, D.C., Sherman, K.J., Koepsell, T.D., & Deyo, R.A. (2001). Lessons from a trial of acupuncture and massage for low back pain: patient expectations and treatment effects. *Spine*, 26, 1418-1424.

METHODS: 135 patients with chronic low back pain who received acupuncture or massage were studied. Study participants were asked to describe their expectations regarding the helpfulness of each treatment on a scale of 0 to 10. **RESULTS:** Improved function was observed for 86% of the participants with higher expectations for the treatment they received, as compared with 68% of those with lower expectations. Patients who expected greater benefit from massage than from acupuncture were more likely to experience better outcomes with massage than with acupuncture, and vice versa.

Hsieh, L.L., Kuo, C.H., Yen, M.F., & Chen, T.H. (2004). A randomized controlled clinical trial for low back pain treated by acupressure and physical therapy. *Preventive Medicine*, 39, 168-176.

METHODS: The aim of this study was to compare the efficacy of acupressure with that of physical therapy in reducing low back pain. 146 participants with chronic low back pain were randomly assigned to the acupressure group or the physical therapy group, each with a different treatment technique. **RESULTS:** The mean posttreatment pain score after a 4-week treatment in the acupressure group was lower than that in the physical therapy group. At the 6-month follow-up assessment, the mean pain score in the acupressure group was still lower than that of the physical therapy group.

Sherman, K.J., Cherkin, D.C., Connelly, M.T., Erro, J., Savetsky, J.B., Davis, R.B. & Eisenberg, D. M. (2004). Complementary and alternative medical therapies for chronic low back pain: What treatments are patients willing to try? *BMC Complementary and Alternative Medicine*, 19, 4-9.

METHODS: Patients with chronic low back pain using automated visit data from one health care organization in Boston and another in Seattle were interviewed. **RESULTS:** Except for chiropractic, knowledge about these therapies was low. Chiropractic and massage had been used by the largest fractions of respondents (54% and 38%, respectively), mostly for back pain (45% and 24%, respectively). Among prior users of specific CAM therapies for back pain, massage was rated most helpful. Users of chiropractic reported treatment-related "significant discomfort, pain or harm" more often (23%) than users of other therapies (5-16%). Respondents expected massage would be most helpful (median of 7 on a 0 to 10 scale) and meditation least helpful (median of 3) in relieving their current pain. Most respondents indicated they would be "very likely" to try acupuncture, massage, or chiropractic for their back pain if they did not have to pay out of pocket and their physician thought

it was a reasonable treatment option.

Yip, Y.B., & Tse, S.H. (2004). The effectiveness of relaxation acupoint stimulation and acupressure with aromatic lavender essential oil for non-specific low back pain in Hong Kong: A randomized controlled trial. *Complementary Therapy Medicine, 12, 28-37.*

METHODS: This study assessed the effect of acupoint stimulation with electrodes combined with acupressure using an aromatic essential oil (lavender) as an add-on-treatment on pain relief and enhancing the physical functional activities among adults with sub-acute or chronic non-specific low back pain. The intervention was an 8-session relaxation acupoint stimulation followed by acupressure with lavender oil over a 3-week period. The control group received usual care only.

RESULTS: One week after the end of treatment, the intervention group had a 39% greater reduction in VAS pain intensity than the control group, improved walking time and greater lateral spine flexion range.

Wang, S., DeZinno, P., Fermo, L., William, K., Caldwell-Andrews, A., Bravemen, F. & Kain, Z. (2005). Complementary and alternative medicine for low-back pain in pregnancy: A cross-sectional survey. *Journal of Alternative and Complementary Medicine, 11, 459-464.*

METHODS: A survey was given to pregnant women and providers of prenatal health care (nurse educators, nurse midwives, and obstetricians). **RESULTS:** The majority of pregnant women who participated in our survey (61.7%) reported that they would accept complementary and alternative medicine (CAM) therapy as treatment for low back pain (LBP) during pregnancy. Similarly, 61% of providers of prenatal health care reported that they would consider using CAM as treatment for LBP during pregnancy. Massage (61.4%), acupuncture (44.6%), relaxation (42.6%), yoga (40.6%), and chiropractic (36.6%) were the most common CAM therapies recommended for LBP in pregnancy by the providers of prenatal health care in our sample.

Behavioral Problems

Escalona, A., Field, T., Cullen, C., Hartshorn, K., & Cruz, C. (2001). Behavior problem preschool children benefit from massage therapy. *Early Child Development and Care, 161, 1-5.*

METHODS: Twenty preschool children with behavior problems were randomly assigned to a massage group or a story reading attention control group. The sessions occurred for 15-minutes twice a week for a month. Pre and post session ratings were made on the first and last days of the study by teachers who were blind to the child's group assignment. **RESULTS:** These revealed that the children in the massage therapy group: 1) were more drowsy, less active, less talkative and had lower anxiety levels after the sessions; and 2) were less anxious and more cooperative by the end of the study.

Shoemaker, J. K., Tidus, P. M., & Mader, R. (1997). Failure of manual massage to alter limb blood flow: Measures by Doppler ultrasound. *Medicine and Science in Sports and Exercise 1, 610-614.*

METHODS: The ability of manual massage to alter muscle blood flow through three types of massage treatments in a small (forearm) and a large (quadriceps) muscle mass was tested in 10

healthy individuals. A certified massage therapist administered effleurage, petrissage, and tapotement treatments to the forearm flexors (small muscle mass) and quadriceps (large muscle mass) muscle groups in a counterbalanced manner. Limb blood flow was determined from mean blood velocity (MBV) (pulsed Doppler) and vessel diameter (echo Doppler). MBV values were obtained from the continuous data sets prior to treatment, and at 5, 10, and 20 s and 5 min following the onset of massage. Arterial diameters were measured immediately prior to and following the massage treatments; these values were not different and were averaged for the blood flow calculations. **RESULTS:** The MBV and blood flows for brachial and femoral arteries, respectively, were not altered by any of the massage treatments in either the forearm or quadriceps muscle groups. Mild voluntary handgrip and knee extension contractions resulted in peak blood velocities and blood flow for brachial and femoral arteries, respectively, which were significantly elevated from rest. The results indicated that manual massage did not elevate muscle blood flow irrespective of massage type or the muscle mass receiving the treatment.

Mori, H., Ohsawa, H., Tanaka, T.H., Taniwaki, E., Leisman, G. & Nishijo, K. (2004). Effect of massage on blood flow and muscle fatigue following isometric lumbar exercise. *Medical Science Monitor*, 10, 173-178.

METHODS: Subjects participated in two experimental sessions (massage and rest conditions). Subjects lay prone on the table and were instructed to extend their trunks until the inferior portion of their rib cage no longer rested on the table. Subjects held this position for 90 seconds (Load I). Subjects then received massage on the lumbar region or rested for 5 minutes, then repeated the same load (Load II). Skin blood flow (SBF), muscle blood volume (MBV), skin temperature (ST), and subjects' subjective feelings of fatigue were evaluated using Visual Analogue Scale (VAS). **RESULTS:** An increase of MBV between pre- and post-load II periods was higher after massage than after rest. An increase of SBF at pre- and post-load II was observed only under massage condition. An increase of SBF between post-load I and pre-load II periods was higher after massage than after rest. An increase of ST between post-load I and post-load II periods was greater after massage than after rest. The VAS score was lower with massage than with rest in the post-treatment period.

Blood Pressure

Albert, N.M., Gillinov, A.M., Lytle, B.W., Feng, J., Cwynar, R. & Blackstone, E.H. (2009). A randomized trial of massage therapy after heart surgery. *Heart and Lung: The Journal of Critical Care*, 38, 480-490.

METHODS: Cardiac surgery patients were randomized to usual postoperative care or usual care plus two massages. **RESULTS:** Postoperative blood pressure was lower after massage.

Kurosawa, M., Lundeberg, T., Agren, G., Lund, I., & Uvnas-Moberg, K. (1995). Massage-like stroking of the abdomen lowers blood pressure in anesthetized rats: influence of oxytocin. *Journal of the Autonomic Nervous System*, 56, 26-30.

METHODS: The ventral and/or lateral sides of the abdomen were stroked in pentobarbital anesthetized, artificially ventilated rats. Arterial blood pressure was recorded with a pressure transducer via catheter in the carotid artery. **RESULTS:** Stroking of the ventral or both ventral and

lateral sides of the abdomen for 1 minute caused a marked decrease in arterial blood pressure (approx. 50 mmHg). After cessation of the stimulation blood pressure returned to the control level within 1 min. Stroking only the lateral sides of the abdomen elicited a significantly smaller decrease in blood pressure (approx. 30 mmHg decrease) than stroking the ventral side.

Hernandez-Reif, M., Field, T., Krasnegor, J. & Theakston, H. (2000). High blood pressure and associated symptoms were reduced by massage therapy. *Journal of Bodywork and Movement Therapies*, 4, 31-38.

METHODS: Thirty adults with controlled hypertension (for at least the last six months) were randomly assigned to either a massage therapy group or a progressive relaxation group. Those in the massage group were given twice-weekly 30-minute massage sessions for five weeks. Participants in the progressive muscle relaxation group received instructions on completing self-administered, twice-weekly 30-minute exercises for five weeks. **RESULTS:** Results showed that while both groups had lower anxiety levels (STAI) and lower levels of depression (CES-D), only the massage therapy group showed decreases in sitting diastolic and systolic blood pressure; decreases in salivary and urinary cortisol stress-hormone levels; and lower scores for depression, anxiety and hostility.

McNamara, M.E., Burnham, D.C., Smith, C., & Carroll, D.L. (2003). The effects of back massage before diagnostic cardiac catheterization. *Alternative Therapies*, 9, 50-57.

METHODS: The purpose of this study was to measure the effects of a 20-minute back massage on the physiological and psychological human responses of patients admitted for a diagnostic cardiac catheterization. Data were compared in a repeated measures design before massage, immediately following the back massage or standard care, and 10 minutes later. **RESULTS:** There was a reduction in systolic blood pressure in the treatment group. In addition, main effects were noted for time for diastolic blood pressure, respiration, total Profile of Mood States score and pain perception in both groups.

Olney, C.M. (2005). The effect of therapeutic back massage in hypertensive persons: a preliminary study. *Biological Research for Nursing*, 7, 98-105.

METHODS: This study tested the effects of a regularly applied back massage on the BP of patients with clinically diagnosed hypertension. A 10-min back massage was given to the experimental group, three times a week for 10 sessions. The control group relaxed in the same environment for 10 min, three times a week for 10 sessions. **RESULTS:** Systolic BP decreased over time, as did the diastolic BP.

Breast Cancer

Hernandez-Reif, M., Ironson, G., Field, T., Katz, G., Diego, M., Weiss, S., Fletcher, M., Schanberg, S. & Kuhn, C. (2003). Breast cancer patients have improved immune functions following massage therapy. *Journal of Psychosomatic Research*, 57, 45-52.

METHODS: Women diagnosed with Stage I or II breast cancer were randomly assigned post surgery to a massage therapy group (to receive 30-minute massages three times per week for 5 weeks) or a standard treatment control group. On the first and last day of the study, the women were assessed on 1) immediate effects measures of anxiety, depressed mood, and vigor, and 2) longer term effects

on depression, anxiety and hostility, functioning, body image and avoidant versus intrusive coping style, in addition, to urinary catecholamines (norepinephrine, epinephrine, and dopamine), and serotonin levels. A subset of 27 women (n= 15 massage) had blood drawn to assay immune measures. **RESULTS:** The immediate massage therapy effects included reduced anxiety, depressed mood, and anger. The longer-term massage effects included reduced depression and hostility, increased urinary dopamine, serotonin values, natural killer cell number and lymphocytes. Avoidance coping was associated with greater NK cell number and intrusive coping with lower dopamine levels.

Hernandez-Reif, M., Field, T., Ironson, G., Beutler, J., Vera, Y., Hurley, J., Fletcher, M., Schanberg, S., Kuhn, C., & Fraser, M. (2005). Natural killer cells and lymphocytes increase in women with breast cancer following massage therapy. *International Journal of Neuroscience, 115, 495-510*

METHODS: Women diagnosed with breast cancer received massage therapy or practiced progressive muscle relaxation (PMR) for 30-minute sessions three times a week for 5-weeks or received standard treatment. The massage therapy and relaxation groups reported less depressed mood, anxiety and pain immediately after their first and last sessions. By the end of the study, however, only the massage therapy group reported being less depressed and less angry and having more vigor. Dopamine levels, Natural Killer cells and lymphocytes also increased from the first to the last day of the study for the massage therapy group.

Listing, M., Krohn, M., Liezmann, C., Kim, I, Reissbauer, A., Peters, E., Lapp, B.F. & Rauchfuss, M. (2010). The efficacy of classical massage on stress perception and cortisol following primary treatment of breast cancer.

METHODS: Women diagnosed with breast cancer were randomized into an intervention or control group. For 5 weeks the intervention group received biweekly 30-min classical massages and the control group received no additional treatment to their routine healthcare. **RESULTS:** Compared with the control group, women in the intervention group reported lower mood disturbances and perceived stress levels were reduced after massage therapy.

Sturgeon, M., Wetta-Hall, R., Hart, T., Good, M., & Dakhil, S. (2009). Effects of therapeutic massage on the quality of life among patients with breast cancer during treatment. *Journal of Complementary Medicine, 15, 373-380.*

METHODS: Breast cancer patients received a massage for 3 consecutive weeks. **RESULTS:** Participants reported lower state anxiety, and improved sleep quality, and quality of life/ function.

Breast Massage

Yokoyama, Y., Ueda, T., Irahara, M., & Aono, T. (1994). Releases of oxytocin and prolactin during breast massage and suckling in puerperal women. *European Journal of Obstetrics, Gynecology & Reproductive Biology, 53, 17-20.*

METHODS: The responses of prolactin and oxytocin to suckling and breast massage were examined

in lactating women. **RESULTS:** The suckling group showed an increase in frequency of pulsatile release of oxytocin and an increase in the plasma prolactin level. In contrast, the breast massage group showed a significant, but not a pulsatile increase in the plasma oxytocin level and no increase in the plasma prolactin level. These findings suggest that suckling causes both milk production and milk ejection, while breast massage causes only ejection of milk already stored, and that prolactin release is not related to an increase of the oxytocin level itself, but to its pulsatile release.

Jones, E., Dimmock, P.W., & Spencer, S.A. (2001). A randomised controlled trial to compare methods of milk expression after preterm delivery. *Archives of Disease in Childhood Fetal and Neonatal Edition, 85, 91-95.*

METHODS: Women were randomly assigned to use either simultaneous (both breasts simultaneously) or sequential (one breast then the other) milk expression. Stratification was used to ensure that the groups were balanced for parity and gestation. A crossover design was used for massage, with patients acting as their own controls. Women were randomly assigned to receive either massage or non-massage first. **RESULTS:** Milk yield per expression was: sequential pumping with no massage, 51 g; sequential pumping with massage, 79 g; simultaneous pumping with no massage, 88 g; simultaneous pumping with massage, 125 g. The fat concentration in the milk was not affected by the increase in volume achieved by the interventions. Thus, simultaneous pumping was more effective at producing milk than sequential pumping and breast massage had an additive effect, improving milk production in both groups.

Foda, M.I., Kawashima, T., Nakamura, S., Kobayashi, M., & Oku, T. (2004). Composition of milk obtained from unmassaged versus massaged breasts of lactating mothers. *Journal of Pediatrics and Gastroenterology Nutrition, 38, 484-487.*

METHODS: Milk samples were obtained immediately before and after massage from healthy, exclusively breast-feeding Japanese mothers at two different periods of lactation one <3 months the other >3 months after parturition. Lipids, whey protein, casein, lactose, ash, and total solids were measured in milk samples. The gross energy content of milk was estimated. **RESULTS:** Breast massage significantly increased lipids in the late lactating period but not in the early lactating period. In the early lactating period casein was increased by breast massage but was not significantly affected in the late lactating period. Breast massage caused a significant increase in total solids from the first day to 11 months postpartum. The gross energy in the late lactating period was significantly increased by breast massage but not in the early lactating period.

Bulimia

Field, T., Schanberg, S., Kuhn, C., Field, T., Fierro, K., Henteleff, T., Mueller, C., Yando, R., Shaw, S. & Burman, I. (1998). Bulimic adolescents benefit from massage therapy. *Adolescence, 33, 555-563.*

METHODS: Twenty-four female adolescent bulimic inpatients were randomly assigned to a massage therapy or a standard treatment (control) group. **RESULTS:** The massaged patients showed immediate reductions in anxiety and depression (both self-report and behavior observation). In addition, by the last day of the therapy, they had lower depression scores, lower cortisol (stress) levels, higher dopamine levels, and they showed improvement on several other psychological

and behavioral measures.

Burn

Field, T., Peck, M., Krugman, S., Tuchel, T., Schanberg, S., Kuhn, C., & Burman, I. (1998). Burn injuries benefit from massage therapy. *Journal of Burn Care and Rehabilitation, 19, 241-244.*

METHODS: Twenty-eight adult patients with burns were randomly assigned before debridement to either a massage therapy group or a standard treatment control group. **RESULTS:** State anxiety and cortisol levels decreased, and behavior ratings of state, activity, vocalizations, and anxiety improved after the massage therapy sessions on the first and last days of treatment. Longer-term effects were also significantly greater for the massage therapy group including decreases in depression and anger, and decreased pain on the McGill Pain Questionnaire, Present Pain Intensity Scale, and Visual Analogue Scale. Although the underlying mechanisms are not known, these data suggest that debridement sessions were less painful after the massage therapy sessions due to a reduction in anxiety, and that the clinical course was probably enhanced as a result of a reduction in pain, anger, and depression.

Field, T., Peck, M., Hernandez-Reif, M., Krugman, S., Burman, I., & Ozment-Schenck, L. (2000). Postburn itching, pain, and psychological symptoms are reduced with massage therapy. *Journal of Burn Care & Rehabilitation, 21, 189-193.*

METHODS: Twenty patients with burn injuries were randomly assigned to a massage therapy or a standard treatment control group during the remodeling phase of wound healing. The massage therapy group received a 30-minute massage with cocoa butter to a closed, moderate-sized scar tissue area twice a week for 5 weeks. **RESULTS:** The massage therapy group reported reduced itching, pain, and anxiety and improved mood immediately after the first and last therapy sessions, and their ratings on these measures improved from the first day to the last day of the study.

Hernandez-Reif, M., Field, T., Largie, S., Hart, S., Redzepi, M., Nierenberg, B., & Peck, M. (2001). Childrens' distress during burn treatment is reduced by massage therapy. *Journal of Burn Care and Rehabilitation, 22, 191-195.*

METHODS: Before dressing changes, 24 young children (mean age = 2.5 years) hospitalized for severe burns received standard dressing care or massage therapy in addition to standard dressing care. The massage therapy was conducted to body parts that were not burned. **RESULTS:** During the dressing change, the children who received massage therapy showed minimal distress behaviors and no increase in movement other than torso movement. In contrast, the children who did not receive massage therapy responded to the dressing change procedure with increased facial grimacing, torso movement, crying, leg movement and reaching out. Nurses also reported greater ease in completing the dressing change procedure for the children in the massage therapy group. These findings suggest that massage therapy attenuates young children's distress responses to aversive medical procedures and facilitates dressing changes.

Hernandez-Reif, M., Field, T., Diego, M., & Fraser, M (2007). Lower Back Pain And Sleep Disturbances Are Reduced Following Massage Therapy. *Journal of Bodyworks and Movement*

Therapies, 11, 141-145.

METHODS: Twenty-four adults with lower back pain were randomly assigned to a massage therapy or a progressive muscle relaxation group. Sessions were 30 minutes long twice a week for five weeks. On the first and last day of the 5-week study, participants completed questionnaires, provided a urine sample and were assessed for range of motion. **RESULTS:** By the end of the study, the massage therapy group, as compared to the relaxation group, reported experiencing less pain, depression and anxiety, and improved sleep. They also showed improvement trunk flexion, and their serotonin and dopamine levels were higher.

Parlak Gürol, A., Polat, S. & Akçay, M.N. (2010). Itching, pain, and anxiety levels are reduced with massage therapy in burned adolescents. *Journal of Burn Care and Research*, 31, 429-432.

METHODS: Adolescents were massaged after admission to a burn unit. **RESULTS:** After 5 weeks, massage therapy reduced pain, itching and state anxiety.

Cancer

Grealish, L., Lomasney, A., & Whiteman, B. (2000). Foot massage. A nursing intervention to modify the distressing symptoms of pain and nausea in patients hospitalized with cancer. *Cancer Nursing*, 23, 237-243.

METHODS: This article describes the findings of an empirical study on the use of foot massage as a nursing intervention in patients hospitalized with cancer. **RESULTS:** In a sample of 87 subjects, a 10-minute foot massage (5 minutes per foot) was found to reduce perceptions of pain, nausea, and relaxation when measured with a visual analog scale.

Stephenson, N.L., Weinrich, S.P., & Tavakoli, A.S. (2000). The effects of foot reflexology on anxiety and pain in patients with breast and lung cancer. *Oncology Nursing Forum*, 27, 67-72.

METHODS: To test the effects of foot reflexology on anxiety and pain in patients with breast and lung cancer. **RESULTS:** Following the foot reflexology intervention, patients with breast and lung cancer experienced a significant decrease in anxiety. One of three pain measures showed that patients with breast cancer experienced a significant decrease in pain.

Wilkie, D.J., Kampbell, J., Cutshall, S., Halabisky, H., Harmon, H., Johnson, L.P., Weinacht, L., & Rake-Marona, M. (2000). Effects of massage on pain intensity, analgesics and quality of life in patients with cancer pain: A pilot study of a randomized clinical trial conducted within hospice care delivery. *Hospice Journal*, 15, 31-53.

METHODS: This randomized controlled clinical trial examined the effects of massage on perceived pain intensity, prescribed morphine, hospital admissions, and quality of life. Massage interventions consisted of 4, twice-weekly massages. Baseline and outcome measurements were obtained before the 1st and after the 4th massages. **RESULTS:** Pain intensity, pulse rate, and respiratory rate were significantly reduced immediately after the massages. At study entry, the massage group reported higher pain intensity which decreased by 42% compared to a 25% reduction in

the control group.

Rexilius, S.J., Mundt, C., Erickson Megel, M., & Agrawal, S. (2002). Therapeutic effects of massage therapy and handling touch on caregivers of patients undergoing autologous hematopoietic stem cell transplant. *Oncology Nursing Forum*, 29, 35-44.

METHODS: This study examined the effects of massage therapy and Healing Touch on anxiety, depression, subjective caregiver burden, and fatigue experienced by caregivers of patients undergoing autologous hematopoietic stem cell transplant. **RESULTS:** Results showed significant declines in anxiety scores, depression, general fatigue, reduced motivation fatigue, and emotional fatigue for individuals in the massage therapy group only.

Smith, M.C., Kemp, J., Hemphill, L., & Vojir, C.P. (2002). Outcomes of therapeutic massage for hospitalized cancer patients. *Journal of Nursing Scholarship*, 34, 257-262.

METHODS: To examine the effects of therapeutic massage on perception of pain, subjective sleep quality, symptom distress, and anxiety in patients hospitalized for treatment of cancer, twenty participants received therapeutic massage and 21 received the control therapy, nurse interaction. **RESULTS:** Mean scores for pain, sleep quality, symptom distress, and anxiety improved from baseline for the subjects who received therapeutic massage; only anxiety improved from baseline for participants in the comparison group. Sleep improved only slightly for the participants receiving massage, but it deteriorated significantly for those in the control group.

Forchuk, C., Baruth, P., Prendergast, M., Holliday, R., Bareham, R., Brimmer, S., Schulz, V., Chan, Y. C., Yammine, N. (2004). Postoperative arm massage: A support for women with lymph node dissection. *Cancer Nursing*, 27, 25-33.

METHODS: To evaluate the usefulness of arm massage from a significant other following lymph node dissection surgery, subjects' significant others in the intervention group were first taught, then performed arm massage as a postoperative support measure. **RESULTS:** Participants reported a reduction in pain in the immediate postoperative period and better shoulder function. Arm massage decreased pain and discomfort related to surgery, and promoted a sense of closeness and support between subjects and their significant other.

Shin, Y.H., Kim, T.I., Shin, M.S., & Juon, H.S. (2004). Effect of acupressure on nausea and vomiting during chemotherapy cycle for Korean postoperative stomach cancer patients. *Cancer Nursing*, 27, 267-274.

METHODS: Despite the development of effective antiemetic drugs, nausea and vomiting remain the main side effects associated with cancer chemotherapy. The purpose of this study was to examine the effect of acupressure on emesis control in postoperative gastric cancer patients undergoing chemotherapy. Forty postoperative gastric cancer patients receiving the first cycle of chemotherapy were divided into control and intervention groups. Both groups received regular antiemesis medication; however, the intervention group received acupressure training and was instructed to perform the finger acupressure maneuver for 5 minutes on the point located at 3-finger widths up from the first palmar crease, at least 3 times a day before chemotherapy and mealtimes or based on their

needs. Both groups received equally frequent nursing visits and consultations, and reported nausea and vomiting. **RESULTS:** Significant differences were noted between intervention and control groups in the severity of nausea and vomiting, the duration of nausea, and frequency of vomiting. This study suggests that acupressure appears to be an effective adjunct maneuver in the course of emesis control.

Soden, K., Vincent, K., Craske, S., Lucas, C., & Ashley, S. (2004). A randomized controlled trial of aromatherapy massage in a hospice setting. *Palliative Medicine, 18, 87-92.*

METHODS: Research suggests that patients with cancer, particularly in the palliative care setting, are increasingly using aromatherapy and massage. There is good evidence that these therapies may be helpful for anxiety reduction for short periods, but few studies have looked at the longer term effects. This study was designed to compare the effects of four-week courses of aromatherapy massage and massage alone on physical and psychological symptoms in patients with advanced cancer. Forty-two patients were randomly assigned to receive weekly massages with lavender essential oil (aromatherapy group), an inert carrier oil only (massage group) or no intervention. **RESULTS:** We were unable to demonstrate any significant long-term benefits of aromatherapy or massage in terms of improving pain control, anxiety or quality of life. Sleep scores improved significantly in both the massage and the combined massage (aromatherapy and massage) groups. There were also statistically significant reductions in depression scores in the massage group.

Billhult, A., Lindholm, C., Gunnarsson, R., Stener-Victorin, E. (2009). The effect of massage on immune function and stress in women with breast cancer--a randomized controlled trial. *Autonomic Neuroscience, 150, 111-115.*

METHODS: Women, with breast cancer were assigned to a massage or an attention control group. **RESULTS:** Massage decreased the deterioration of NK cell activity occurring during radiation therapy and lowered heart rate and systolic blood pressure.

Listing, M., Reissauer, A., Krohn, M., Voigt, B., Tjahono, G., Becker, J., Klapp, B.F., & Rauchfuss, M. (2009). Massage therapy reduces physical discomfort and improves mood disturbances in women with breast cancer. *Psychooncology, 18, 1290-1299.*

METHODS: Women with breast cancer were randomized into a massage or a control group. For 5 weeks, bi-weekly 30-min massages were given in the back, head, and neck. **RESULTS:** A greater decrease in physical discomfort and group fatigue was noted in the massage group as well as mood disturbance. The effect of massage on mood disturbances was greater when treated continuously by the same therapist.

Post-White, J., Fitzgerald, M., Savik, K., Hooke, M.C., Hannahan, A.B., Sencer, S.F.(2009). Massage therapy for children with cancer. *Journal of Pediatric Oncology Nursing, 26, 16-28.*

METHODS: Children with cancer received 4 weekly massages alternated with 4 weekly quiet-time control sessions. **RESULTS:** Massage was more effective than quiet time at reducing heart rate and anxiety in children as well as parent anxiety.



Cardiovascular

Boone, T. & Cooper, R. (1995). The effect of massage on oxygen consumption at rest. *American Journal of Chinese Medicine*, 23, 37-41.

METHODS: This study determined the effect of massage on oxygen consumption at rest. Ten healthy, adult males volunteered to serve as subjects. During the Control Session, each subject was placed in the supine position on a massage table to remain motionless for 30 minutes. During the Treatment Session, each subject received a 30-minute sports massage of the lower extremities. Oxygen consumption was measured. **RESULTS:** The subjects' oxygen consumption did not change with the massage. Also, there were no significant differences in heart rate, stroke volume, cardiac output, and arteriovenous oxygen difference during the massage. These findings indicate that massaging the lower extremities results in neither an increase nor a decrease in the subjects' expenditure of energy at rest.

Lewis, P., Nichols, E., Mackey, G., Fadol, A., Sloane, L., Villagomez, E., & Liehr, P. (1997). The effect of turning and backrub on mixed venous oxygen saturation in critically ill patients. *American Journal of Critical Care*, 6, 132-140.

METHODS: A repeated-measures design was used to examine the effect of a change in body position (right or left lateral) and timing of backrub (immediate or delayed) on mixed venous oxygen saturation in 57 surgical ICU patients. Mixed venous oxygen saturation was recorded at 1-minute intervals for 5 minutes in each of three periods: baseline, after turning, and after backrub. Subjects were randomly assigned to body position and timing of backrub. Subjects in the immediate-backrub group were turned and given a 1-minute backrub. Mixed venous oxygen saturation was measured at 1-minute intervals for 5 minutes at two points: after the backrub and then with the patient lying on his side. For subjects in the delayed-backrub group, saturation was measured at

1-minute intervals for 5 minutes at two different points: after the subject was turned to his side and after the backrub. **RESULTS:** Both position and timing of backrub had significant effects on mixed venous oxygen saturation across conditions over time. Subjects positioned on their left side had a significantly greater decrease in saturation when the backrub was started. At the end of the backrub, saturation was significantly lower in subjects lying on their left side than in subjects lying on their right side. The pattern of change differed according to the timing of the backrub, and return to baseline levels of saturation after intervention differed according to body position. Two consecutive interventions (change in body position and backrub) caused a greater decrease in mixed venous oxygen saturation than the two interventions separated by a 5-minute equilibration period. Turning to the left side decreased oxygen saturation more than turning to the right side did. Oxygen saturation returned to clinically acceptable ranges within 5 minutes of the intervention.

Boone, T., Tanner, M., & Radosevich, A. (2001). Effects of a 10-minute back rub on cardiovascular responses in healthy subjects. *American Journal of Chinese Medicine*, 29, 47-52

METHODS: This study determined the cardiovascular responses to a 10-minute back rub. Twelve healthy, college-age males and females volunteered to participate as subjects. The subjects were assessed for 10 minutes on a massage table lying on one side. During the treatment period, a back rub was administered. Oxygen consumption and cardiac output were measured. **RESULTS:** The central and peripheral components of oxygen consumption were changed and cardiac output decreased. These results indicate that the back rub was effective in inducing relaxation.

Delaney, J.P., Leong, K.S., Watkins, A., & Brodie, D. (2002). The short-term effects of myofascial trigger point massage therapy on cardiac autonomic tone in healthy subjects. *Journal of Advanced Nursing*, 37, 364-371.

METHODS: This study investigated the effects of myofascial trigger-point massage therapy to the head, neck and shoulder areas on cardiac autonomic tone. A 5-minute cardiac interbeat interval recording, systolic and diastolic blood pressure and subjective self-evaluations of muscle tension and emotional state were taken before and after intervention. **RESULTS:** Following myofascial trigger-point massage therapy there was a significant decrease in heart rate, systolic blood pressure and diastolic blood pressure. Analysis of heart rate variability revealed a significant increase in parasympathetic activity following myofascial trigger-point massage therapy. Additionally both muscle tension and emotional state showed significant improvement.

McNamara, M.E., Burnham, D.C., Smith, C., & Carroll, D.L. (2003). The effects of back massage before diagnostic cardiac catheterization. *Alternative Therapies in Health Medicine*, 9, 50-57.

METHODS: The purpose of this study was to measure the effects of a 20-minute back massage on the physiological and psychological human responses of patients admitted for a diagnostic cardiac catheterization. **RESULTS:** There was a significant reduction in systolic blood pressure in the treatment group. In addition, main effects were noted for time for diastolic blood pressure, respiration, total Profile of Mood States score and pain perception in both groups.

Wentworth, L.J., Briese, L.J., Timimi, F.K., Sanvick, C.L., Bartel, D.C., Cutshall, S.M., Tilbury, R. T., Lennon, R., & Bauer, B.A. (2009). Massage therapy reduces tension, anxiety, and pain in patients awaiting invasive cardiovascular procedures. *Progress in Cardiovascular Nursing*, 24, 155-161.
METHODS: Patients awaiting invasive cardiovascular procedures received 20 minutes massage at least 30 minutes before the procedure. **RESULTS:** Pain, anxiety, and tension scores were lower for the massage group than the control group receiving standard care.

Carpal Tunnel Syndrome

Field, T., Diego, M., Cullen, C., Hartshorn, K., Gruskin, A., Hernandez-Reif, M., & Sunshine, W. (2004). Carpal tunnel syndrome symptoms are lessened following massage therapy. *Journal of Bodywork and Movement Therapies*, 8, 9-14.
METHODS: The objective of this study was to determine the effectiveness of massage therapy for relieving the symptoms of Carpal Tunnel Syndrome (CTS). Sixteen adults with CTS symptoms were randomized to a 4-week massage therapy or control group. Participants in the massage therapy group were taught a self-massage routine that was done daily at home. They were also massaged once a week by a therapist. The participants' diagnosis was based on a nerve conduction velocity test, the Phalen test, and the Tinel sign test performed by a physician. The participants were also given the State Trait Anxiety Inventory (STAI), the Profile of Mood States (POMS), a visual analog scale for pain and a test of grip strength. **RESULTS:** Participants in the massage therapy group improved on median peak latency and grip strength. They also experienced lower levels of perceived pain, anxiety, and depressed mood.

Cerebral Palsy

Hernandez-Reif, M., Field, T., Lergie, S., Diego, M., Manigat, N., Seonanes, J., Bornstein, J. & Waldman, R. (2005). Cerebral Palsy symptoms in children decreased following massage therapy. *Journal of Early Child Development and Care*, 175, 445-456.
METHODS: Twenty young children (M age = 32 months) with Cerebral Palsy (CP) recruited from early intervention programs received 30-minutes of massage or reading twice weekly for 12 weeks. **RESULTS:** The children receiving massage therapy showed fewer physical symptoms including reduced spasticity, less rigid muscle tone overall and in the arms and improved fine and gross motor functioning. In addition, the massage group had improved cognition, social and dressing scores on the Developmental Profile and they showed more positive facial expressions and less limb activity during face-to-face play interactions.

Chronic Fatigue Syndrome

Field, T, Sunshine, W., Hernandez-Reif, M., Quintino, O., Schanberg, S., Kuhn, C., & Burman, I. (1997). Chronic fatigue syndrome: Massage therapy effects on depression and somatic symptoms in chronic fatigue syndrome. *Journal of Chronic Fatigue Syndrome*, 3, 43-51.
METHODS: Twenty chronic fatigue syndrome subjects were randomly assigned to a massage therapy or

a SHAM TENS (transcutaneous electrical stimulation) control group. **RESULTS:** Immediately following the massage therapy versus SHAM TENS on the first and last days of the study the massage therapy group had lower depression and anxiety scores and lower cortisol levels. Longer-term effects (last day versus first day) suggested that the massage therapy versus the SHAM TENS group had lower depression, emotional distress and somatic symptom scores, more hours of sleep and lower epinephrine and cortisol levels.

Cocaine Exposure

Wheeden, A., Scafidi, F.A., Field, T., Ironson, G., Valdeon, C. & Bandstra, E. (1993). Massage effects on cocaine-exposed preterm neonates. *Journal of Developmental and Behavioral Pediatrics, 14, 318-322.*
METHODS: Thirty cocaine-exposed preterm neonates (mean gestational age 30 weeks, mean birth weight = 1212 g, mean intensive care unit duration = 18 days) were randomly assigned to a massage therapy or a control group as soon as they were considered medically stable. Group assignment was based on a random stratification of gestational age, birth weight, intensive care unit duration, and entry weight into the study. The treatment group (N=15) received massages for three 15-minute periods over 3 consecutive hours for a 10-day period. **RESULTS:** Findings suggested that the massaged infants (1) averaged 28% greater weight gain per day (33 vs 26 g) although the groups did not differ on intake (calories or volume), (2) showed significantly fewer postnatal complications and stress behaviors than the control infants, and (3) demonstrated more mature motor behaviors on the Brazelton examination at the end of the 10-day study period.

Cognition (Learning)

Cigales, M., Field, T., Lundy, B., Cuadra, A., Hart, S. (1997). Massage enhances recovery from habituation in normal infants. *Infant Behavior and Development, 20, 29-34.*
METHODS: Four-month-old infants were given either 8 minutes of massage, play, or no stimulation prior to an audiovisual habituation task. **RESULTS:** Infants who received massage showed response recovery from habituation during test trials, whereas those in the other two conditions did not.

Hart, S., Field, T., Hernandez-Reif, M., & Lundy, B. (1998). Preschoolers' cognitive performance improves following massage. *Early Child Development & Care, 143, 59-64.*

METHODS: Preschoolers (M age = 4 years, 4 months) were given WPPSI subtests, including Block Design, Animal Pegs and Mazes, before and after receiving a 15-minute massage or spending 15-minutes reading stories with an experimenter. **RESULTS:** Performance on the Block Design improved following massage and accuracy was greater on the Animal Pegs in the massage group.

Constipation

Bishop, E., McKinnon, E., Weir, E., & Brown, D.W. (2003). Reflexology in the management of encopresis and chronic constipation. *Paediatric Nursing, 15, 20-21.*

METHODS: This study investigated the efficacy of treating patients with encopresis and chronic constipation with reflexology. An observational study was carried out of 50 children between three and 14 years of age who had a diagnosis of encopresis/chronic constipation. The children received six sessions of 30-minutes of reflexology to their feet. With the help of their parents they

completed questionnaires on bowel movements and soiling patterns before, during and after the treatment. A further questionnaire was completed by parents pre and post treatment on their attitude towards reflexology. Forty-eight of the children completed the sessions. **RESULTS:** The number of bowel movements increased and the incidence of soiling decreased.

Lámás, K., Lindholm, L., Stenlund, H., Engström, B., & Jacobsson, C. (2009). Effects of abdominal massage in management of constipation: A randomized controlled trial. *International Journal of Nursing Students, 46*, 759-797.

METHODS: People with constipation were randomized to an abdominal massage group in addition to an earlier prescribed laxative or control group receiving only laxatives. **RESULTS:** Abdominal massage significantly decreased severity of gastrointestinal symptoms, constipation syndrome and abdominal pain syndrome. The massage group also had increased bowel movements.

Cystic Fibrosis

Hernandez-Reif, M., Field, T., Krasnegor, J., Martinez, E., Schwartzman, M. & Mavunda, K. (1999). Children with cystic fibrosis benefit from massage therapy. *Journal of Pediatric Psychology, 24*, 175-181.

METHODS: Parents massaged their children with cystic fibrosis to reduce anxiety and their children's anxiety and to improve the children's mood and peak air flow readings. Twenty children (5-12 years old) with cystic fibrosis and their parents were randomly assigned to a massage therapy or a reading control group. Parents in the treatment group were instructed and asked to conduct a 20-minute child massage every night at bedtime for one month. Parents in the reading control group were instructed to read for 20 minutes a night with their child for one month. On days 1 and 30, the parents and children answered questions relating to present anxiety levels and the children answered questions relating to mood, and their peak air flow was measured. **RESULTS:** Following the first and last massage session, the children and parents reported reduced anxiety. Mood and peak air flow readings also improved for the children in the massage therapy group.



Dancers

Leivadi, S., Hernandez-Reif, M., Field, T., O'Rourke, M., D'Arienzo, S., Lewis, D., del Pino, N., Schanberg, S., Kuhn, C. (1999). Massage Therapy and Relaxation Effects on University Dance Students. *Journal of Dance Medicine & Science*, 3, 108-112. METHODS: Thirty female university dancers were randomly assigned to a massage therapy or relaxation therapy group. The therapies consisted of 30-minute sessions twice a week for five weeks. **RESULTS:** Both groups reported less depressed mood and lowered anxiety levels. However, saliva cortisol (stress hormones) decreased only for the massage therapy group. Both groups reported less neck, shoulder, and back pain after the treatment sessions and reduced back pain across the study. However, only the massage therapy group showed increased range of motion across the study, including neck extension and shoulder abduction.

Dental Pain

Ottoson, D., Ekblom, A., & Hansson, P. (1981). Vibratory stimulation for the relief of pain of dental origin. *Pain*, 10, 37-45.

METHODS: Vibratory stimulation was used for dental pain in 36 patients. The patients were from a clinic for dental surgery and all had suffered pain from pulpal inflammation, apical periodontitis or postoperative pain following extraction of an impacted wisdom tooth for more than 2 days. Vibration at 100 Hz was applied to various points in the facial region or the skull. **RESULTS:** All patients except three experienced an effective reduction in pain intensity. In the patients who experienced pain reduction there was usually a best point at which vibration had a greater pain alleviating effect than

at other points. At some points the stimulation added to the pain. In 16 patients the stimulation caused a reduction in pain intensity of 75-100%; out of these, 12 patients reported a complete relief of pain.

Depression

Field, T., Morrow, C., Valdeon, C., Larson, S., Kuhn, C., & Schanberg, S. (1992). Massage reduces depression and anxiety in child and adolescent psychiatric patients. *Journal of the American Academy of Child & Adolescent Psychiatry, 31, 125-131.*

METHODS: A 30-minute back massage was given daily for a 5-day period to 52 hospitalized depressed and adjustment disorder children and adolescents. **RESULTS:** Compared with a control group who viewed relaxing videotapes, the massaged subjects were less depressed and anxious and had lower saliva cortisol levels after the massage. In addition, nurses rated the subjects as being less anxious and more cooperative on the last day of the study, and nighttime sleep increased over this period. Finally, urinary cortisol and norepinephrine levels decreased, but only for the depressed subjects.

Field, T., Grizzle, N., Scafidi, F., & Schanberg, S. (1996). Massage and relaxation therapies' effects on depressed adolescent mothers. *Adolescence, 31, 903-911.*

METHODS: Thirty-two depressed adolescent mothers received ten 30-minute sessions of massage therapy or relaxation therapy over a five-week period. Subjects were randomly assigned to each group. **RESULTS:** Although both groups reported lower anxiety following their first and last therapy sessions, only the massage therapy group showed behavioral and stress hormone changes including a decrease in anxious behavior, pulse, and salivary cortisol levels. A decrease in urine cortisol levels suggested lower stress following the five-week period for the massage therapy group.

Onozawa, K., Glover, V., Adams, D., Modi, N., & Kumar, R.C. (2001). Infant massage improves mother-infant interaction for mothers with postnatal depression. *Journal of Affective Disorders, 63, 1-3.*

METHODS: Thirty-four primiparous depressed mothers at 4 weeks postpartum were randomly assigned either to an infant massage class and a support group (massage group) or to a support group (control group). Each group attended five weekly sessions. **RESULTS:** The depression scores fell in both groups. However, improvement of mother-infant interactions was seen only in the massage group.

Field, T., Deeds, O., Diego, M., Gualer, A., Sullivan, S., Wilson, D. & Nearing, G. (2009). Benefits of combining massage therapy with group interpersonal psychotherapy in prenatally depressed women. *Journal of Bodywork and Movement Therapies, 13, 297-303.*

METHODS: Pregnant women who were diagnosed depressed were randomly assigned to a group who received group Interpersonal Psychotherapy or to a group who received both group Interpersonal Psychotherapy and massage therapy. The group Interpersonal Psychotherapy (1h sessions) and massage therapy (20 min sessions) were held once per week for 6 weeks. **RESULTS:** The group who received psychotherapy plus massage attended more sessions on average, and a greater percentage of that group completed the 6-week program. The group who received both therapies also showed a greater decrease in depression, depressed affect and somatic-vegetative

symptom scores on the Center for Epidemiological Studies-Depression Scale (CES-D), a greater decrease in anxiety scale (STAI) scores and a greater decrease in cortisol levels.

Field, T., Diego, M., Hernandez-Reif, M., Deeds, O. & Figueiredo, B. (2009). Pregnancy massage reduces prematurity, low birthweight and postpartum depression. *Infant Behavior and Development, 32, 454-460.*

METHODS: Pregnant women diagnosed with major depression were given 12 weeks of twice per week massage therapy by their significant other or only standard treatment as a control group.

RESULTS: The massage therapy group women versus the control group women not only had reduced depression by the end of the therapy period, but they also had reduced depression and cortisol levels during the postpartum period. Their newborns were also less likely to be born prematurely and low birthweight, and they had lower cortisol levels and performed better on the Brazelton Neonatal Behavioral Assessment habituation, orientation and motor scales.

Oswalt, K.L., Biasini, F.J., Wilson, L.L. & Mrug, S. (2009). Outcomes of a massage intervention on teen mothers: A pilot study. *Pediatric Nursing, 35, 284-289.*

METHODS: Adolescent mothers were randomly assigned to an intervention group that practiced massage with their infants or a control group. **RESULTS:** Teaching infant massage enhanced maternal-infant physical contact and lowered depression.

Hou, W.H., Chiang, P.T., Hsu, T.Y., Chiu, S.Y., & Yen, Y.C. (2010). Treatment effects of massage therapy in depressed people: a meta-analysis. *Journal of Clinical Psychiatry, 71, 894-901.*

METHODS: A meta-analysis of randomized controlled trials of massage therapy in depressed people was conducted. **RESULTS:** 17 studies were included and all trials showed positive effect of massage therapy on depressed people.

Dermatitis

Schachner, L., Field, T., Hernandez-Reif, M., Duarte, A. & Krasnegor, J. (1998). Atopic dermatitis symptoms decreased in children following massage therapy. *Pediatric Dermatology, 15, 390-395.*

METHODS: Young children with atopic dermatitis were treated with standard topical care and massage by their parents for 20 minutes daily for a 1 month period. A control group received standard topical care only. **RESULTS:** The children's affect and activity level significantly improved, and their parents' anxiety decreased immediately after the massage therapy sessions. Over the 1 month period, the parents of the massaged children reported lower anxiety levels in their children, and the children improved significantly on all clinical measures including redness, scaling, lichenification, excoriation, and pruritus. The control group only improved significantly on the scaling measure.

Anderson, C., Lis-Balchin, M., & Kirk-Smith, M. (2000). Evaluation of massage with essential oils on childhood atopic eczema. *Phytotherapy Research*, 14, 452-456.

METHODS: Eight children, born to professional working mothers were studied to test the hypothesis that massage with essential oils (aromatherapy) used as a complementary therapy in conjunction with normal medical treatment, would help alleviate the symptoms of childhood atopic eczema. The children were randomly assigned to a massage and a massage with essential oils group. They received massage once a week by a therapist and every day by the mother over a period of 8 weeks. The preferred essential oils, chosen by the mothers for their child, from 36 commonly used aromatherapy oils, were: sweet marjoram, frankincense, German chamomile, myrrh, thyme, benzoin, spike lavender and *Litsea cubeba*. The treatments were evaluated by means of daily day time irritation scores and night time disturbance scores, determined by the mother before and during the treatment, both over an 8 week period. **RESULTS:** The results showed a significant improvement in the eczema in the two groups of children following therapy, but there was no significant difference in improvement shown between the aromatherapy massage and massage only group. Further studies on the essential oil massage group showed a deterioration in the eczematous condition after two further 8 week periods of therapy, following a period of rest after the initial period of contact. This may have been due to a decline in the novelty of the treatment, or, it strongly suggests possible allergic contact dermatitis provoked by the essential oils themselves.

Diabetes

Field, T., Hernandez-Reif, M., LaGreca A., Shaw, K., Schanberg, S., & Kuhn, C. (1997). Massage therapy lowers blood glucose levels in children with Diabetes Mellitus. *Diabetes Spectrum*, 10, 237-239.

METHODS: Twenty diabetic children were randomly assigned to a touch therapy or relaxation therapy group. The children's parents were taught one or the other therapy and were asked to provide them for 20 minutes before bedtime each night for 30 days. **RESULTS:** The immediate effects of the touch therapy were reduced parent anxiety and depressed mood and reduced child anxiety, fidgetiness and depressed affect. Over the 30 day period compliance on insulin and food regulation improved and blood glucose levels decreased from 159 to within the normal range (121).

Diarrhea

Jump, V.K. Fargo, J.D. & Akers, J. (2006). Impact of massage therapy on health outcomes among orphaned infants in Ecuador: Results of a randomized clinical trial. *Family Community Health*, 29, 314-319.

Diarrhea is the second leading cause of death among infants and young children in the developing world. This project investigated whether therapeutic infant massage could reduce diarrheal episodes and decrease overall illness of infants. **METHODS:** Infants living in 2 orphanages in Quito, Ecuador, were matched by age and randomly assigned to a massage therapy or a control group. Daily infant massage therapy was provided by orphanage staff or volunteers, which lasted an average of 53 days, and symptoms of illness data were documented daily by volunteers in the orphanages. **RESULTS:** the control group infants had a 50% greater risk of having diarrhea than experimental infants.

Control group infants were also 11% more likely than experimental infants to experience illness of any kind.

Down Syndrome

Hernandez-Reif, M., Field, T., Bornstein, J. & Fewell, R. (2006). Children with Down Syndrome improved in motor function and muscle tone following massage therapy. *Journal of Early Child Development and Care*, 176, 395-410.

METHODS: Twenty-one moderate to high functioning young children (M age = 2 years) with Down syndrome receiving early intervention (PT, OT and speech therapy) were randomly assigned to also receive two ½-hour massage therapy or reading sessions (control group) per week for two months. On the first and last day of the study, the children were assessed on functioning using the Developmental Programming for Infants and Young Children Scale and muscle tone using a new Likert scale. **RESULTS:** Children in the massage therapy group experienced developmental gains in fine and gross motor functioning and showed less severe hypotonicity in their limbs. These findings suggest that the addition of massage therapy to an early intervention program may enhance motor and muscle functioning for children with Down syndrome.

Drug Addiction

Black, S., Jacques, K., Webber, A., Spurr, K., Carey, E., Hebb, A. & Gilbert, R. (2010). Chair massage for treating anxiety in patients withdrawing from psychoactive drugs. *Journal of Alternative Complementary Medicine*, 126, 979-987.

METHODS: Persons participating in an inpatient withdrawal management program for psychoactive drugs were randomly assigned to receive chair massage or a relaxation control condition. Treatments were offered for 3 consecutive days. **RESULTS:** The magnitude in the reduction in state and trait anxiety was greater in the chair massage group where the effect on state anxiety was sustained, at least in part, for 24 hours.

Elderly



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Field, T., Hernandez-Reif, M., Quintino, O., Schanberg, S. & Kuhn, C. (1998). Elder retired volunteers benefit from giving massage therapy to infants. *Journal of Applied Gerontology*, 17, 229-239.

METHODS: This exploratory within-subjects study compared the effects of elder volunteers giving massage to infants versus receiving massage themselves. Three times a week for 3 weeks, 10 elder volunteers received massage sessions. For another 3 weeks, three times per week, the same elderly volunteers massaged infants at a nursery school. **RESULTS:** Immediately after the first-and last-day sessions of giving massages, the elder retired volunteers had less anxiety and depression and lower stress hormone (salivary cortisol) levels. Over the 3-week period, depression and catecholamines (norepinephrine and epinephrine) decreased and lifestyle and health improved. These effects were not as strong for the 3-week period when they received massage, possibly because the elder retired volunteers initially felt awkward about being massaged and because they derived more satisfaction from massaging the infants.

Hartshorn, K., Delage, J., Field, T., & Olds, L. (2001). Senior citizens benefit from movement therapy. *Journal of Bodywork and Movement Therapies*, 5, 1-5.

METHODS: Sixteen senior citizens participated in four, 50-minute movement therapy sessions over a 2-week period and were compared to 16 senior citizens who belonged to a wait list control group who received the movement sessions only after the end of the study. **RESULTS:** The movement therapy participants improved in their functional motion on the Tinetti scale, and specifically on the gait scale, their leg strength increased, and their leg pain significantly decreased.

Endorphins

Day, J. A., Mason, R. R., & Chesrown, S. E. (1987). Effect of massage on serum level of beta-endorphin and beta-lipotropin in healthy adults. *Physical Therapy*, 67, 926-930.

METHODS: The effect of massage was evaluated on the levels of endogenous opiates in peripheral venous blood. The results were based on findings from 21 healthy, adult volunteers. The volunteers

were assigned randomly to either the Control Group (n = 11) that rested but received no massage or the Experimental Group (n = 10) that received a 30-minute complete back massage. **RESULTS:** No significant pretreatment or posttreatment difference was found in blood beta-endorphin or beta-lipotropin levels between the groups. The results indicate that massage did not change the measured serum levels of beta-endorphin or beta-lipotropin in these healthy subjects without pain.

Enuresis

Yukse, M.S., Erdem, A.F., Atalay, C., & Demirel, A. (2003). Acupressure versus oxybutinin in the treatment of enuresis. *The Journal of International Medical Research*, 31, 552-556.

METHODS: The efficacy of acupressure for treating nocturnal enuresis was compared with oxybutinin. Acupressure was administered to 12 children by their parents, who had been taught the technique. Twelve control patients received oxybutinin. Parents were asked to record incidences of bed-wetting and patients and/or parents completed a questionnaire 15 days and 1, 3 and 6 months after the start of treatment. **RESULTS:** Complete and partial responses after 6 months of treatment were seen in 83% and 16%, respectively, of children treated with acupressure, and in 58% and 33%, respectively, of children who received oxybutinin.

Exercise

Rodenburg, J. B., Steenbeek, D., Schiereck, P., & Bar, P. R. (1994). Warm-up, stretching and massage diminish harmful effects of eccentric exercise. *International Journal of Sports Medicine*. 15, 414-419.

METHODS: The combination of a warm-up, stretching exercises and massage were assessed for their effects on subjective scores for delayed onset muscle soreness (DOMS) and functional and biochemical measures. Fifty people, randomly assigned to a treatment and a control group, exercised with the forearm flexors for 30 min. The treatment group also performed a warm-up and stretching protocol followed by forearm exercise and massage. **RESULTS:** The median values at the five post-exercise time points differed significantly for DOMS measured when the arm was extended. Significant effects for treatment were found on the maximal force, the flexion angle of the elbow and the creatine kinase activity in blood.

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Smith, L. L., Keating, M. N., Holbert, D., Spratt, D. J., McCammon, M. R., Smith, S. S., and Israel, R. G. (1994). The effects of athletic massage on delayed onset muscle soreness, creatine kinase, and neutrophil count: A preliminary report. *Journal of Orthopaedic & Sports Physical Therapy, 19*, 93-99.

METHODS: It was hypothesized that athletic massage administered 2 hours after eccentric exercise would disrupt an initial crucial event in acute inflammation, the accumulation of neutrophils. This would result in a diminished inflammatory response and a concomitant reduction in delayed onset muscle soreness (DOMS) and serum creatine kinase (CK). Untrained males were randomly assigned to a massage or control group. All performed five sets of isokinetic eccentric exercise of the elbow flexors and extensors. Two hours after exercise, massage subjects received a 30-minute athletic massage; control subjects rested. Delayed onset muscle soreness and CK were assessed before exercise and at 8, 24, 48, 72, 96, and 120 hours after exercise. Circulating neutrophils were assessed before and immediately after exercise, and at 30-minute intervals for 8 hours; cortisol was assessed before and immediately after exercise, and at 30-minute intervals for 8 hours; CK was assessed at similar times. **RESULTS:** A trend analysis revealed a significant treatment by time interaction effect for 1) DOMS, with the massage group reporting reduced levels; 2) CK, with the massage group displaying reduced levels; 3) neutrophils, with the massage group displaying a prolonged elevation; and 4) cortisol, with the massage group showing a diminished diurnal reduction. The results of this study suggest that sports massage will reduce DOMS and CK when administered 2 hours after the termination of eccentric exercise. This may be due to a reduced emigration of neutrophils and/or higher levels of serum cortisol.

Rinder, A.N. & Sutherland, C.J. (1995). An investigation of the effects of massage on quadriceps performance after exercise fatigue. *Complement Ther Nurs Midwifery, 1*, 99-102.

METHODS: Thirteen males and 7 females completed their maximum number of leg extensions against

a half maximum load. In a randomised, crossover study they were exercised to fatigue using an ergometer, ski-squats and leg extensions followed either by a 6 min massage or rest after which they again completed their maximum number of leg extensions against half maximum load. The process was repeated a few days later with the alternative condition (rest or massage). **RESULTS:** Massage after exercise fatigue significantly improved quadriceps performance compared to rest.

Viitasalo, J. T., Niemela, K., Kaappola, R., Korjus, T., Levola, M., Mononen, H. V., Rusko, H. K., and Takala, T. E. (1995). Warm underwater water-jet massage improves recovery from intense physical exercise. *European Journal of Applied Physiology & Occupational Physiology*, 71, 431-438.

METHODS: The effects of warm underwater water-jet massage on neuromuscular functioning, selected biochemical parameters (serum creatine kinase, lactic dehydrogenase, serum carbonic anhydrase, myoglobin, urine urea and creatinine) and muscle soreness were studied among 14 junior track and field athletes. Each subject spent, in a randomized order, two identical training weeks engaged in five strength/power training sessions lasting 3 days. **RESULTS:** The training weeks differed from each other only in respect to underwater water-jet massage treatments. These were used three times (20 min each) during the treatment week and not used during the control week. During the treatment week continuous jumping power decreased and ground contact time increased significantly less ($P < 0.05$) and serum myoglobin increased more than during the control week. It is suggested that underwater water-jet massage in connection with intense strength/power training increases the release of proteins from muscle tissue into the blood and enhances the maintenance of neuromuscular performance capacity.

Hemmings, B., Smith, M., Graydon, J. & Dyson, R. (2000). Effects of massage on physiological restoration, perceived recovery, and repeated sports performance. *Br J Sports Med*, 34, 109-14.

METHODS: Eight amateur boxers completed two performances on a boxing ergometer on two occasions in a counterbalanced design. Boxers initially completed performance 1, after which they received a massage or passive rest intervention. Each boxer then gave perceived recovery ratings before completing a second performance, which was a repeated simulation of the first. Heart rates and blood lactate and glucose levels were also assessed before, during, and after all performances. **RESULTS:** A repeated measures analysis of variance showed no significant group differences for either performance, although a main effect was found showing a decrement in punching force from performance 1 to performance 2. The massage intervention significantly increased perceptions of recovery compared with the passive rest intervention. Blood lactate concentration after the second performance was significantly higher following massage.

Drust, B., Atkinson, G., Gregson, W., French, D. & Binningsley, D. (2003). The effects of massage on intra muscular temperature in the vastus lateralis in humans. *International Journal of Sports Medicine*, 24, 395-399.

METHODS: The aim of the current investigation was to evaluate the effect of different durations of massage, and ultrasound treatment, on the temperature of the vastus lateralis muscle in males. Deep effleurage massage of the vastus lateralis was performed on seven healthy males for 5, 10 and 15

min periods. A 5-min period of ultrasound at 45 KHz was also completed by all subjects. Intra muscular temperature (at 1.5, 2.5 and 3.5 cm) and thigh skin temperature were assessed pre and post treatment. Heart rate was monitored continuously throughout all conditions. **RESULTS:** Pre treatment intra muscular temperature increased as depth of measurement increased. Changes in muscle temperature at 1.5 and 2.5 cm were significantly greater following massage than ultrasound. No significant differences between massage treatments and ultrasound were noted when intra muscular temperature was measured at 3.5 cm. Massage also significantly increased both heart rate and thigh skin temperature compared to ultrasound. Increases in intra muscular temperature, heart rate and thigh skin temperature were the same irrespective of massage duration. These data suggest that massage and ultrasound have only limited effects on deep muscle temperature.

Hilbert, J.E., Sforzo, G.A. & Swensen, T. (2003). The effects of massage on delayed onset muscle soreness. *Br J Sports Med*, 37, 72-5.

METHODS: Eighteen volunteers were randomly assigned to either a massage or control group. Delayed onset muscle soreness was induced with six sets of eight maximal eccentric contractions of the right hamstring, which were followed 2 h later by 20 min of massage or sham massage (control). Peak torque and mood were assessed at 2, 6, 24, and 48 h postexercise. Range of motion (ROM) and intensity and unpleasantness of soreness were assessed at 6, 24, and 48 h postexercise. Neutrophil count was assessed at 6 and 24 h postexercise. **RESULTS:** Intensity of soreness was significantly lower in the massage group relative to the control group at 48 h postexercise.

Mori, H., Ohsawa, H., Tanaka, T.H., Taniwaki, E., Leisman, G. & Nishijo, K. (2004). Effect of massage on blood flow and muscle fatigue following isometric lumbar exercise. *Med Sci Monit*, 10, 173-8.

METHODS: Twenty-nine healthy male subjects participated in two experimental sessions (massage and rest conditions). Subjects lay prone on the table and were instructed to extend their trunks until the inferior portion of their rib cage no longer rested on the table. Subjects held this position for 90 seconds (Load I). Subjects then either received massage on the lumbar region or rested for 5 minutes, then repeated the same load (Load II). Skin blood flow (SBF), muscle blood volume (MBV), skin temperature (ST), and subjects' subjective feelings of fatigue were evaluated using Visual Analogue Scale (VAS). **RESULTS:** An increase of MBV between pre- and post-load II periods was higher after massage than after rest. An increase of SBF at pre- and post-load II was observed only under massage condition. An increase of SBF between post-load I and pre-load II periods was higher after massage than after rest. An increase of ST between post-load I and post-load II periods was greater after massage than after rest. The VAS score was lower with massage than with rest in the post-treatment period.

Robertson, A., Watt, J.M. & Galloway, S.D. (2004). Effects of leg massage on recovery from high intensity cycling exercise. *British Journal of Sports Medicine*, 4, 173-176.

METHODS: Nine male games players participated. They attended the laboratory on two occasions one week apart and at the same time of day. Dietary intake and activity were replicated for the two preceding days on each occasion. After baseline measurement of heart rate and blood lactate concentration, subjects performed a standardised warm up on the cycle ergometer. This

was followed by six standardised 30 second high intensity exercise bouts, interspersed with 30 seconds of active recovery. After five minutes of active recovery and either 20 minutes of leg massage or supine passive rest, subjects performed a second standardised warm up and a 30 second Wingate test. Capillary blood samples were drawn at intervals, and heart rate, peak power, mean power, and fatigue index were recorded. **RESULTS:** Significantly lower fatigue index was observed in the massage trial.

Brooks, C.P., Woodruff, L.D., Wright, L.L. & Donatelli, R. (2005). The immediate effects of manual massage on power-grip performance after maximal exercise in healthy adults. *Journal of Alternative and Complementary Medicine*, 11, 1093-101.

METHODS: This study assessed the effects of using manual massage to improve power-grip performance immediately after maximal exercise in healthy adults. Fifty-two volunteer massage-school clients, staff, faculty, and students participated. Subjects randomly received either a 5-minute forearm/hand massage of effleurage and friction (to either the dominant hand or nondominant hand side), 5 minutes of passive shoulder and elbow range of motion, or 5 minutes of nonintervention rest. **RESULTS:** After 3 minutes of isometric exercise, power grip was consistently fatigued to at least 60% of baseline, with recovery occurring over the next 5 minutes. Massage had a greater effect than no massage or than placebo on grip performance after fatigue, especially in the nondominant-hand group.

Zainuddin, Z., Newton, M., Sacco, P. & Nosaka, K. (2005). Effects of massage on delayed-onset muscle soreness, swelling, and recovery of muscle function. *J Athl Train*, 40, 174-80.

METHODS: This study tested the hypothesis that massage applied after eccentric exercise would effectively alleviate delayed-onset muscle soreness (DOMS) without affecting muscle function. We used an arm-to-arm comparison model with 2 independent variables (control and massage) and 6 dependent variables (maximal isometric and isokinetic voluntary strength, range of motion, upper arm circumference, plasma creatine kinase activity, and muscle soreness). A 2-way repeated-measures analysis of variance and paired t-tests were used to examine differences in changes of the dependent variable over time between control and massage conditions. Ten healthy subjects with no history of upper arm injury and no experience in resistance training, performed 10 sets of 6 maximal isokinetic eccentric actions of the elbow flexors with each arm on a dynamometer, separated by 2 weeks. One arm received 10 minutes of massage 3 hours after eccentric exercise; the contralateral arm received no treatment. **RESULTS:** Delayed-onset muscle soreness was significantly less for the massage condition for peak soreness in extending the elbow joint and palpating the brachioradialis muscle. Soreness while flexing the elbow joint and palpating the brachialis muscle was also less with massage. Massage treatment had significant effects on plasma creatine kinase activity, with a significantly lower peak value at 4 days postexercise, and upper arm circumference, with a significantly smaller increase than the control at 3 and 4 days postexercise.

Facial Massage

Yamada, Y., Hatayama, T., Hirata, T., Maruyama, K., et al.(1986). A psychological effect of facial estherapy. *Tohoku Psychologica Folia*, 45, 6-16.

METHODS: Changes in emotion, level of arousal, and facial skin state were assessed in 24

female undergraduates by the use of 3 types of checklists. **RESULTS:** Two adjective checklists indicated that on items of both general deactivation and deactivation-sleep factors, many subjective rating scores were heightened after the facial esthetic massage and most subjects in the experimental group showed that the subjective state of their faces was much improved.

Fibromyalgia

Sunshine, W., Field, T., Schanberg, S., Quintino, O., Kilmer, T., Fierro, K., Burman, I., Hashimoto, M., McBride, C., & Henteleff, T. (1996). Massage therapy and transcutaneous electrical stimulation effects on fibromyalgia. *Journal of Clinical Rheumatology*, 2, 18-22.

METHODS: Thirty adult fibromyalgia syndrome subjects were randomly assigned to a massage therapy, a transcutaneous electrical stimulation (TENS), or a transcutaneous electrical stimulation no-current group (Sham TENS) for 30-minute treatment sessions two times per week for 5 weeks. **RESULTS:** The massage therapy subjects reported lower anxiety and depression, and their cortisol levels were lower immediately after the therapy sessions on the first and last days of the study. The TENS group showed similar changes, but only after therapy on the last day of the study. The massage therapy group improved on the dolorimeter measure of pain. They also reported less pain the last week, less stiffness and fatigue, and fewer nights of difficult sleeping. Thus, massage therapy was the most effective therapy with these fibromyalgia patients.

Field, T., Diego, M., Cullen, C., Hernandez-Reif, M., & Sunshine, W. (2002). Fibromyalgia pain and substance P decreases and sleep improves following massage therapy. *Journal of Clinical Rheumatology*, 8, 72-76.

METHODS: To determine the effects of massage therapy versus relaxation therapy on sleep, substance P and pain in fibromyalgia patients, twenty four adult fibromyalgia patients were randomly assigned to a massage therapy or relaxation therapy group. They received 30-minute treatments twice a week for five weeks. **RESULTS:** Both groups showed a decrease in anxiety and depressed mood immediately after the first and last therapy sessions. However, across the course of the study only the massage therapy group reported an increase in the number of sleep hours and a decrease in their sleep movements. In addition, substance P levels decreased and the patients' physicians assigned lower disease and pain ratings and rated fewer tenderpoints in the massage therapy group.

Gastrointestinal Motility

Chen, L.L., Hsu, S.F., Wang, M.H., Chen, C.L., Lin, Y.D., & Lai, J.S. (2003). Use of acupressure to improve gastrointestinal motility in women after trans-abdominal hysterectomy. *The American Journal of Chinese Medicine*, 31, 781-790.

METHODS: The purpose of this study was to evaluate the effectiveness of acupressure on gastrointestinal (GI) motility in women after trans-abdominal hysterectomy (TAH). Patients were randomly assigned into two groups of 21 and 20 patients each. The experimental group received acupressure for 3 minutes at each of three meridian points. The control group received 3 minutes of acupressure on sham points. Acupressure was performed twice a day. A questionnaire was used to determine patients' satisfaction prior to and after afternoon acupressure. GI contractions were measured with a multifunctional stethoscope before and after acupressure. **RESULTS:** Acupressure

of these three meridian points significantly increased GI motility in the experimental group, but there was little change in the control group.

Diego MA, Field T, Hernandez-Reif M. (2005). Vagal activity, gastric motility, and weight gain in massaged preterm neonates. *Journal of Pediatrics*, 147, 50-55

METHODS: The present randomized study explored this potential underlying mechanism by assessing gastric motility and sympathetic and parasympathetic nervous system activity in response to massage therapy (moderate pressure) versus sham massage (light pressure) and control conditions in a group of preterm neonates. **RESULTS:** Compared with preterm neonates receiving sham massage, preterm neonates receiving massage therapy exhibited greater weight gain and increased vagal tone and gastric motility during and immediately after treatment. Gastric motility and vagal tone during massage therapy were significantly related to weight gain.

Headache

Hernandez-Reif, M., Field, T., Dieter, J., Swerdlow. & Diego, M., (1998). Migraine Headaches are Reduced by Massage Therapy. *International Journal of Neuroscience*, 96, 1-11.

METHODS: Twenty-six adults with migraine headaches were randomly assigned to a massage therapy group, which received twice-weekly 30-minute massages for five consecutive weeks or a wait-list control group. **RESULTS:** The massage group reported fewer distress symptoms, less pain, more headache free days, fewer sleep disturbances and taking fewer analgesics. They also showed increased serotonin levels.

Moraska, A. & Chandler, C. (2009). Changes in Psychological Parameters in Patients with Tension-type Headache Following Massage Therapy: A Pilot Study. *The Journal of Manual and Manipulative Therapy*, 17, 86-94.

METHODS: Adults with episodic or chronic tension-type headaches received massage therapy. **RESULTS:** After 6 weeks the massage therapy group showed less depression and anxiety.

Quinn, C., Chandler, C., & Moraska, A. (2002). Massage therapy and frequency of chronic tension headaches. *American Journal of Public Health*, 92, 1657-1661.

METHODS: This study examined the effects of massage therapy on chronic, nonmigraine headache. Four chronic tension headache sufferers (aged 18-55 yrs) received structured massage therapy treatment directed toward the neck and shoulder muscles during a 4-wk period. **RESULTS:** Massage therapy reduced the number of weekly headaches. Headache frequency was significantly reduced within the initial week of massage treatment, and continued for the remainder of the study. A trend toward reduction in average duration of each headache event between the baseline period and the treatment period was also observed.

Foster, K.A., Liskin, J., Cen, S., Abbott, A., Armisen, V., Globe, D., Knox, L., Mitchell, M., Shtir, C., & Azen, S. (2004). The Trager approach in the treatment of chronic headache: A pilot study.

Alternative Therapies in Health Medicine, 10, 40-46.

METHODS: Thirty-three volunteers with a self-reported history of chronic headache and with at least one headache per week for at least 6 months received Trager massage. **RESULTS:** Participants randomized to Trager massage demonstrated a significant decrease in the frequency of headaches, improvement in head quality of life and a 44% decrease in medication usage.

Moraska, A., Chandler, C. (2009). Changes in Psychological Parameters in Patients with Tension-type Headache Following Massage Therapy: A Pilot Study. *The Journal of Manual & Manipulative Therapy, 17, 86-94.*

METHODS: Twice weekly, 45-minute massages were given to patients with tension headaches for 6 weeks. **RESULTS:** Depression and anxiety decreased following 6 weeks of massage, but not 3 weeks.

HIV

Ironson, G., Field, T., Scafidi, F., Hashimoto, M., Kumar, M., Kumar, A., Price, A., Goncalves, A., Burman, I., Tetenman, C., Patarca, R., & Fletcher, M. A. (1996). Massage therapy is associated with enhancement of the immune system's cytotoxic capacity. *International Journal of Neuroscience, 84, 205-217.*

METHODS: Twenty-nine gay men (20 HIV+, 9 HIV-) received daily massages for one month. A subset of 11 of the HIV+ subjects served as a within subjects control group (one month with and without massages). **RESULTS:** Major immune findings for the effects of the month of massage included a significant increase in Natural Killer Cell number, Natural Killer Cell Activity, and CD8. No changes occurred in HIV disease progression markers. Neuroendocrine findings measured via 24 hour urine sample included a decrease in cortisol and trends toward decreased catecholamines. Decreased anxiety and increased relaxation were significantly correlated with increased NK cell number.

Scafidi, F. & Field, T. (1996). Massage therapy improves behavior in neonates born to HIV positive mothers. *Journal of Pediatric Psychology, 21, 889-898.*

METHODS: Neonates born to HIV-positive mothers were randomly assigned to a massage therapy or control group. The treatment infants were given three 15-minute massages daily for 10 days. **RESULTS:** The massaged group showed superior performance on almost every Brazelton newborn cluster score and had a greater daily weight gain at the end of the treatment period unlike the control group who showed declining performance.

Diego, M.A., Hernandez-Reif, M., Field, T., Friedman, L. & Shaw, K. (2001). HIV adolescents show improved immune function following massage therapy. *International Journal of Neuroscience, 106, 35-45.*

METHODS: HIV+ adolescents (M CD4= 466mm³) recruited from a large urban university hospital's outpatient clinic were randomly assigned to receive massage therapy (n= 12) or progressive muscle relaxation (n= 12) two-times per week for 12 weeks. To assess treatment effects, participants were assessed for depression, anxiety and immune changes before and after the 12 week treatment period. **RESULTS:** Adolescents who received massage therapy versus those who experienced relaxation therapy reported feeling less anxious and they were less depressed and

showed enhanced immune function by the end of the 12 week study. Immune changes included increased Natural Killer cell number. In addition, the HIV disease progression markers CD4/CD8 ratio and CD4 number increased for the massage therapy group only.

Hospice

Meek, S. S. (1993). Effects of slow stroke back massage on relaxation in hospice clients. *Journal of Nursing Scholarship*, 25, 17-21.

METHODS: Slow stroke back massage was provided for 30 hospice patients. **RESULTS:** The massage was associated with decreases in systolic BP, diastolic BP, and heart rate and with an increase in skin temperature.

Hypertension

Hernandez-Reif, M., Field, T., Krasnegor, J., Theakston, H., Hossain, Z., & Burman, I. (2000). High blood pressure and associated symptoms were reduced by massage therapy. *Journal of Bodywork and Movement Therapies*, 4, 31-38.

METHODS: High blood pressure is associated with elevated anxiety, stress and stress hormones, hostility, depression and catecholamines. Massage therapy and progressive muscle relaxation were evaluated as treatments for reducing blood pressure and associated symptoms. Adults who had been diagnosed as hypertensive received ten 30-minute massage sessions over five weeks or they were given progressive muscle relaxation instructions (control group). **RESULTS:** Sitting diastolic blood pressure decreased after the first and last massage therapy sessions and reclining diastolic blood pressure decreased from the first to the last day of the study. Although both groups reported less anxiety, only the massage therapy group reported less depression and hostility and showed decreased urinary and salivary hormone levels (cortisol). Massage therapy may be effective in reducing diastolic blood pressure and symptoms associated with hypertension.

Infants



Scholtz, K., & Samuels, C. A. (1992). Neonatal bathing and massage intervention with fathers: Behavioral effects 12 weeks after birth of the first baby. *International Journal of Behavioral Development, 15, 67-81.*

METHODS: Australian families with first-born babies were studied for effects of a 4-week-postpartum training program (demonstration of baby massage and the Burleigh Relaxation Bath technique), with emphasis on the father-infant relationship. 16 families were assigned to the treatment group and 16 served as controls. **RESULTS:** At the 12-week home observation, the treatment group infants greeted their fathers with more eye contact, smiling, vocalizing, reaching, and orienting responses and showed less avoidance behaviors. During a 10-min observation, the treatment group fathers showed greater involvement with their infants.

Field, T., Grizzle, N., Scafidi, F., Abrams, S., & Richardson, S. (1996). Massage therapy for infants of depressed mothers. *Infant Behavior and Development 19, 109-114.*

METHODS: Forty full-term 1- to 3-month-old infants born to depressed adolescent mothers who were low socioeconomic status (SES) and single parents were given 15 minutes of either massage or rocking for 2 days per week for a 6-week period. **RESULTS:** The infants who experienced massage therapy compared to infants in the rocking control group spent more time in active alert and active awake states, cried less, and had lower salivary cortisol levels, suggesting lower stress. After the massage versus the rocking sessions, the infants spent less time in an active awake state, suggesting that massage may be more effective than rocking for inducing sleep. Over the 6-week period, the

massage-therapy infants gained more weight, showed greater improvement on emotionality, sociability, and soothability temperament dimensions and had greater decreases in urinary stress catecholamines/hormones (norepinephrine, epinephrine, cortisol).

Scafidi, F. and Field, T. (1996). Massage therapy improves behavior in neonates born to HIV-positive mothers. *Journal of Pediatric Psychology, 21, 889-897.*

METHODS: 28 neonates born to HIV-positive mothers were randomly assigned to a massage therapy or control group. The treatment infants were given three 15-minute massages daily for 10 days.

RESULTS: The massaged group showed superior performance on almost every Brazelton newborn cluster score and had a greater daily weight gain at the end of the treatment period, unlike the control group who showed declining performance.

Cullen, C., Field, T., Escalona, A. & Hartshorn, K. (2000). Father-infant interactions are enhanced by massage therapy. *Early Child Development and Care, 164, 41-47.*

METHODS: Fathers gave their infants daily massages 15 minutes prior to bedtime for one month.

RESULTS: By the end of the study, the fathers who massaged their infants were more expressive and showed more enjoyment and more warmth during interactions with their infants.

Huhtala, V., Lehtonen, L., Heinonen, R., & Korvenranta, H. (2000). Infant massage compared with crib vibrator in the treatment of colicky infants. *Pediatrics, 105, E84.*

METHODS: This study evaluated the effectiveness of infant massage as compared to a crib vibrator in the treatment of infantile colic. Infants <7 weeks of age and perceived as colicky by their parents were randomly assigned to an infant massage group (n = 28) or a crib vibrator group (n = 30). Three daily intervention periods were recommended in both groups. Parents recorded infant crying and interventions given in a structured cry diary that was kept for 1 week before (baseline) and for 3 weeks during the intervention. **RESULTS:** Over the 4-week study, the amount of total and colicky crying decreased significantly in both intervention groups. Ninety-three percent of the parents in both groups reported that colic symptoms decreased over the 3-week intervention.

Field, T. & Hernandez-Reif, M. (2001). Sleep problems in infants decrease following massage therapy. *Early Child Development and Care, 168, 95-104.*

METHODS: Infants and toddlers (mean age=1.5 years) with sleep onset problems were given daily massages by their parents for 15 minutes prior to bedtime for 1 month. **RESULTS:** Based on parent diaries, the massaged versus the control children (who were read bedtime stories) showed fewer sleep problems and had a shorter latency to sleep onset by the end of the study. Forty-five minute behavior observations by an independent observer also revealed more time awake, alert and active and more positive affect in the massaged children by the end of the study.

Ferber, S.G., Laudon, M., Kuint, J., Weller, A., & Zisapel, N. (2002). Massage therapy by mothers enhances the adjustment of circadian rhythms to the nocturnal period in full-term infants. *Journal of Developmental and Behavioral Pediatrics, 23, 410-415.*

METHODS: This study investigated the effect of massage therapy on phase adjustment of rest-activity

and melatonin secretion rhythms to the nocturnal period in full-term infants. Rest-activity of infants was measured by actigraphy before and after 14 days of massage therapy (starting at approximately age 10 days) and subsequently at 6 and 8 weeks of age. Melatonin was assessed in urine samples at 6, 8, and 12 weeks of age. **RESULTS:** At 8 weeks the controls revealed 1 peak of activity at approximately 12 midnight and another one at approximately 12 noon, whereas in the treated group, a major peak was early in the morning and a secondary peak in the late afternoon. At 12 weeks, nocturnal melatonin excretions were significantly higher in the treated infants. Thus, massage therapy by mothers in the perinatal period serves as a strong time cue, enhancing coordination of the developing circadian system with environmental cues.

Kim, T.I., Shin, Y.H., & White-Traut, R.C. (2003). Multisensory intervention improves physical growth and illness rates in Korean orphaned newborn infants. *Res Nurs Health, 26, 424-433.*

METHODS: The purpose of this study was to evaluate the effectiveness of a multisensory intervention on the physical growth and health of Korean orphaned infants. Fifty-eight full-term infants were randomly assigned to a control or an experimental group within 14 days postbirth. In addition to receiving the routine orphanage care, infants in the experimental group received 15 min of auditory (female voice), tactile (massage), and visual (eye-to-eye contact) stimulation twice a day, 5 days a week, for 4 weeks. **RESULTS:** Compared to the control group, the experimental group gained significantly more weight and had larger increases in length and head circumference after the 4-week intervention period and at 6 months of age. In addition, the experimental group had significantly fewer illnesses and clinic visits.

Infants Massage Review Papers

Uvnas-Moberg, K., Widstrom, A. M., Marchini, G., and Winberg, J. (1987). Release of GI hormones in mother and infant by sensory stimulation. *Acta Paediatrica Scandinavia, 76, 851-860.*

REVIEW: Sensory stimulation is of great importance for the growth and the physiological and psychological development of infants. Supplementary sensory stimulation such as non-nutritive sucking and tactile stimulation has been shown to increase the growth rate and the maturation of premature infants. In human neonates non-nutritive sucking has a vagally mediated influence on the levels of some gastrointestinal hormones. In animal experiments afferent electrical stimulation of the sciatic nerve at low intensity leads to an activation of the vagal nerve and to a consequent release of vagally controlled gastrointestinal hormones such as gastrin and cholecystokinin. We therefore assume that both non-nutritive sucking and tactile stimulation trigger the activity of sensory nerves which leads to a release of vagally regulated gut hormones. Since gut hormones stimulate gastrointestinal motor and secretory activity and the growth of the gastrointestinal tract, and enhance the glucose-induced insulin release, they may contribute to the beneficial effects on maturation and growth caused by sensory stimulation. In the breast-feeding situation, the sucking of the child elicits similar reflexes in the mother leading to an activation of the maternal gut endocrine system and a consequent increase in energy uptake.

Field, T. (1995). Massage therapy for infants and children. *Journal of Developmental &*

Behavioral Pediatrics, 16, 105-111.

Data are reviewed on the effects of massage therapy on infants and children with various medical conditions. The infants include: premature infants, cocaine-exposed infants, HIV-exposed infants, infants parented by depressed mothers, and full-term infants without medical problems. The childhood conditions include: abuse (sexual and physical), asthma, autism, burns, cancer, developmental delays, dermatitis, diabetes, eating disorders (anorexia and bulimia), juvenile rheumatoid arthritis, posttraumatic stress disorder, and psychiatric problems. Generally, the massage therapy has resulted in lower anxiety and stress hormones and improved clinical course. Having grandparent volunteers and parents give the therapy enhances their own wellness and provides a cost-effective treatment for the children.

Field, T. (2000). Infant massage therapy (Review). In Zeanah, Charles H. Jr. (Ed), Handbook of infant mental health (2nd ed.). (pp. 494-500). New York, NY, US: Guilford Press.

REVIEW: The author describes infant massage as a therapeutic intervention. She points to its worldwide popularity and to a small but growing body of literature suggesting its efficacy. Her review makes clear that it provides ample opportunities for infant-caregiver change. This approach may be a primary intervention in some settings and a useful adjunct in others.

Shor-Posner, G., Hernandez-Reif, M., Miguez, M., Fletcher, M., Quintero, N., Baez, J., Perez-Then, E. Soto, S., Mendoza, R., Castillo, R. & Zhang, G. (2006). Impact of a massage therapy clinical trial on immune status in young Dominican children infected with HIV-1. *Journal of Alternative and Complementary Medicine, 12, 511-516.*

METHODS: Dominican HIV+ children without current access to antiretroviral therapies were randomized to receive either massage or a control/friendly visit twice weekly for 12 weeks. Blood was drawn at baseline and following the 3-month intervention for determinations of the HIV disease markers CD4 and CD8 cell counts. **RESULTS:** Despite similar immune parameters at baseline in the two groups, significantly more of the control group exhibited a decline in CD4 cell count postintervention. The decrease was particularly evident in older (5-8 years) children in the control group, who demonstrated a significant reduction in both CD4 and CD8 cell counts compared to massage-treated older children who remained stable or showed immune improvement. Additionally, a significant increase in CD4 cells was observed over the 12-week trial in the massage-treated older children but not in the control group. In younger massage-treated children, (2-4 years old), a significant increase in natural killer cells was shown.

Job Stress

Field, T., Ironson, G., Scafidi, F., Nawrocki, T., Goncalves, A., Burman, I., Pickens, J., Fox, N., Schanberg, S., & Kuhn, C. (1996). Massage therapy reduces anxiety and enhances EEG pattern of alertness and math computations. *International Journal of Neuroscience, 86, 197-205.*

METHODS: Twenty-six adults were given a chair massage and 24 control group adults were asked to relax in the massage chair for 15 minutes, two times per week for five weeks. On the first and last days of the study they were monitored for EEG before, during and after the sessions. In addition, before and after the sessions they performed math computations, they completed POMS Depression and

State Anxiety Scales and they provided a saliva sample for cortisol. At the beginning of the sessions they completed Life Events, Job Stress and Chronic POMS Depression Scales. **RESULTS:** Analyses revealed the following: 1) frontal delta power increased for both groups, suggesting relaxation; 2) the massage group showed decreased frontal alpha and beta power (suggesting enhanced alertness), while the control group showed increased alpha and beta power; 3) the massage group showed increased speed and accuracy on math computations while the control group did not change; 4) anxiety levels were lower following the massage but not the control sessions, although mood state was less depressed following both the massage and control sessions; 5) salivary cortisol levels were lower following the massage but not the control sessions but only on the first day; and 6) at the end of the 5 week period depression scores were lower for both groups but the job stress score was lower only for the massage group.

Cady, S. H., & Jones, G. E. (1997). Massage therapy as a workplace intervention for reduction of stress. *Perceptual & Motor Skills, 84*, 157-158.

METHODS: The effectiveness of a 15-min. on-site massage while seated in a chair was evaluated for reducing stress as indicated by blood pressure. 52 employed participants' blood pressures were measured before and after a 15-min. massage at work. **RESULTS:** Analyses showed a significant reduction in participants' systolic and diastolic blood pressure after receiving the massage.

Field, T., Quintino, O., Henteleff, T., Wells-Keife, L., & Delvecchio-Feinberg, G. (1997). Job stress reduction therapies. *Alternative Therapies in Health and Medicine, 3*, 54-56.

METHODS: The immediate effects of brief massage therapy, music relaxation with visual imagery, muscle relaxation, and social support group sessions were assessed in 100 hospital employees at a major public hospital. **RESULTS:** Each of the groups reported decreases in anxiety, depression, fatigue, and confusion, as well as increased vigor following the sessions. That the groups did not differ on these variables suggests that these particular therapies, when applied for short periods of time, are equally effective for reducing stress among hospital employees.

Katz, J., Wowk, A., Culp, D., & Wakeling, H. (1999). Pain and tension are reduced among hospital nurses after on-site massage treatments: a pilot study. *Journal of Perianesthesia Nursing, 14*, 128-133.

METHODS: The aims of this pilot study were (1) to evaluate the feasibility of carrying out a series of eight 15-minute workplace-based massage treatments, and (2) to determine whether massage therapy reduced pain and stress experienced by nursing staff at a large teaching hospital. Twelve hospital staff (10 registered nurses and 2 nonmedical ward staff) working in a large tertiary care center volunteered to participate. Participants received up to eight, workplace-based, 15-minute Swedish massage treatments provided by registered massage therapists. Pain, tension, relaxation, and the Profile of Mood States were measured before and after each massage session. **RESULTS:** Pain intensity and tension levels were significantly lower after massage. In addition, relaxation levels and overall mood state improved significantly after treatments.



Labor Pain

Field, T., Hernandez-Reif, M., Taylor, S., Quintino, O., & Burman, I. (1997). Labor pain is reduced by massage therapy. *Journal of Psychosomatic Obstetrics and Gynecology*, 18, 286-291.

METHODS: Twenty-eight women were recruited from prenatal classes and randomly assigned to receive massage in addition to coaching in breathing from their partners during labor, or to receive coaching in breathing alone (a technique learned during prenatal classes). **RESULTS:** The massaged mothers reported a decrease in depressed mood, anxiety and more positive affect following the first massage during labor. In addition, the massaged mothers had significantly shorter labor, a shorter hospital stay and less postpartum depression.

Chang, M.Y., Wang, S.Y., & Chen, C.H. (2002). Effects of massage on pain and anxiety during labor: a randomized controlled trial in Taiwan. *Journal of Advanced Nursing*, 38, 68-73.

METHODS: Sixty primiparous women expected to have a normal childbirth in Taiwan were randomly assigned to either the experimental or the control group. The experimental group received massage whereas the control group did not. **RESULTS:** In both groups, there was a relatively steady increase in pain intensity and anxiety level as labor progressed. The experimental group had significantly lower pain reactions and reported that massage was helpful, providing pain relief and psychological support during labour.

Chung, U.L., Hung, L.C., Kuo, S.C., & Huang, C.L. (2003). Effects of LI4 and BL 67 acupressure on labor pain and uterine contractions in the first stage of labor. *The Journal of Nursing Research*, 11, 251-260.

METHODS: 127 parturient women were randomly assigned to three groups. Each group received one of the following treatments, LI4 and BL67 acupressure, light skin stroking, or no treatment/ conversation only. Data collected from the VAS and external fetal monitoring strips were used for analysis. **RESULTS:** Results of the study confirmed the effect of LI4 and BL67 acupressure in lessening labor pain during the active phase of the first stage of labor. There were no verified effects on uterine contractions.

Leukemia

Field, T., Cullen, C., Diego, M., Hernandez-Reif, M., Sprinz, P., Beebe, K., Kissel, B., & Bango-Sanchez, V. (2001). Leukemia immune changes following massage therapy. *Journal of Bodywork*

and Movement Therapies, 5, 271-274.

METHODS: Twenty children with leukemia were provided with daily massage therapy by their parents and were compared to a standard treatment control group. **RESULTS:** Following a month of massage therapy, depressed mood decreased in the children's parents, and the children's white blood cell and neutrophil counts decreased.

Massage Therapists

Lee, A.C. & Kemper, K.J. (2000). Practice patterns of massage therapists. *Journal of Alternative & Complementary Medicine, 6, 527-529.*

METHODS: To describe the practice patterns of licensed massage therapists (LMTs). One hundred and twenty-six (126) massage practices were randomly selected from the Greater Boston Area yellow pages. **RESULTS:** Most respondents were Caucasian (95%) and female (80%). Their mean age was 41 years old. Half held a college degree; on average, practitioners received 1000 hours of training in massage therapy. The majority were in group practices (59%) and saw an average of 20 patients per week. The typical visit lasted 50-60 minutes; the cost was \$60 and rarely covered by insurance (5%). Half of the respondents offered sliding scales to patients, but only 11% accepted Medicaid patients. Respondents reported less than 1 visit per week from pediatric and adolescent patients (<21 years old).

Migraine

Lawler, S. & Cameron, L. (2006). A randomized, controlled trial of massage therapy as a treatment for migraine. *Annual Behavior and Medicine, 32, 50-59.*

METHODS: Migraine sufferers (N = 47) who were randomly assigned to massage or control conditions completed daily assessments of migraine experiences and sleep patterns for 13 weeks. Massage participants attended weekly massage sessions during Weeks 5 to 10. State anxiety, heart rates, and salivary cortisol were assessed before and after the sessions. Perceived stress and coping efficacy were assessed at Weeks 4, 10, and 13. **RESULTS:** Compared to control participants, massage participants exhibited greater improvements in migraine frequency and sleep quality during the intervention weeks and the 3 follow-up weeks. Trends for beneficial effects of massage therapy on perceived stress and coping efficacy were observed. During the sessions, massage induced decreases in state anxiety, heart rate, and cortisol.

Multiple Sclerosis

Hernandez-Reif, M., Field, T., & Theakston, H. (1998). Multiple sclerosis patients benefit from massage therapy. *Journal of Bodywork and Movement Therapies, 2, 168-174.*

METHODS: Twenty-four adults with multiple sclerosis were randomly assigned to a standard medical treatment control group or a massage therapy group that received 45-minute massages twice a week for 5 weeks. **RESULTS:** The massage group had lower anxiety and less depressed mood immediately following the massage sessions, and by the end of the study they had improved self-esteem, better body image and image of disease progression, and enhanced social functioning.

Siev-Ner, I., Gamus, D., Lerner-Geva, L., & Achiron, A. (2003). Reflexology treatment relieves symptoms of multiple sclerosis: A randomized controlled study. *Multiple Sclerosis, 9, 356-361.*

METHODS: Seventy-one MS patients were randomized to either a study or control group, to receive an 11-week treatment. Reflexology treatment included manual pressure on specific points in the feet and massage of the calf area. The control group received nonspecific massage of the calf area.

RESULTS: Significant improvement in paresthesias, urinary symptoms and spasticity was detected in the reflexology group. Improvement with borderline significance was observed in muscle strength between the reflexology group and the controls. The improvement in the intensity of paresthesias remained significant at three months of follow-up.

Muscle Stiffness

Donoyama, N., Munakata, T., &Shibasaki

, M. (2010). Effects of Anma therapy (traditional Japanese massage) on body and mind. *Journal of Bodywork and Movement, 14*, 55-64.

METHODS Females with chronic muscle stiffness in the neck and shoulder received 40-min Anma therapy and 40-min rest. **RESULTS:** Anma therapy reduced muscle stiffness in the neck and shoulder and anxiety levels.

Nausea

Ming, J.L., Kuo, B.I., Lin, J.G., & Lin, L.C. (2002). The efficacy of acupressure to prevent nausea and vomiting in post-operative patients. *Journal of Advanced Nursing, 39*, 343-351.

METHODS: The aim of this study was to examine the effect of stimulating two acupressure points on prevention of post-operative nausea and vomiting. The Rhodes Index of Nausea, Vomiting and Retching questionnaire was used as a tool to measure incidence. To control the motion sickness variable, the subjects who underwent functional endoscopic sinus surgery under general anaesthesia were randomly assigned to a finger-pressing group, a wrist-band group, and a control group. The acupoints and treatment times were similar in the finger-pressing group and wrist-band pressing group, whereas only conversation was employed in the control group. **RESULTS:** Significant differences in the incidence of the post-operative nausea and vomiting were found between the acupressure, wrist-band, and control groups, with a reduction in the incidence rate of nausea from 73% to 43% and vomiting incidence rate from 90% to 43% in the acupressure group.

Nervous System

Diego, M. & Field, T. (2009). Moderate pressure massage elicits a parasympathetic nervous system response. *International Journal of Neuroscience, 119*, 630-638.

METHODS: Twenty healthy adults were randomly assigned to a moderate pressure or a light pressure massage therapy group, and EKGs were recorded during a 3-min baseline, during the 15-min massage period and during a 3-min postmassage period. EKG data were then used to derive the high frequency (HF), low frequency (LF) components of heart rate variability and the low to high frequency ratio (LF/HF) as noninvasive markers of autonomic nervous system activity. **RESULTS:** The participants who received the moderate pressure massage exhibited a parasympathetic nervous system response characterized by an increase in HF, suggesting increased vagal efferent activity and a decrease in the LF/HF ratio, suggesting a shift from sympathetic to parasympathetic activity that peaked during the first half of the massage period. On the other hand, those who received the light

pressure massage exhibited a sympathetic nervous system response characterized by decreased HF and increased LF/HF.

Oil

Field, T., Schanberg, S., Davalos, M., & Malphurs, J. (1996). *Massage with oil has more positive effects on normal infants. Pre- and Perinatal Psychology Journal, 11, 75-80.*

METHODS: Sixty, one-month-old infants were randomly assigned to a massage group with oil and a massage group without oil. Massage had a soothing/calming influence on the infants, particularly when given with oil. **RESULTS:** The infants who received massage with oil were less active, showed fewer stress behaviors and head averting, and their saliva cortisol levels decreased more. In addition, vagal activity increased more following massage with oil versus massage without oil.

Agarwal, K.N., Gupta, A., Pushkarna, R., Bhargava, S.K., Faridi, M.M., & Prabhu, M.K. (2000). *Effects of massage & use of oil on growth, blood flow & sleep pattern in infants. Indian Journal of Medical Research, 112, 212-217.*

METHODS: The present study investigated massage oils commonly used in the community for massaging infants. Full term born healthy infants (n = 125), 6 weeks of age, were randomly divided into five groups. Infants received (i) herbal oil, (ii) sesame oil, (iii) mustard oil, or (iv) mineral oil for massage daily for 4 week. The fifth group did not receive massage and served as a control group. **RESULTS:** Massage improved the weight, length, and midarm and midleg circumferences as compared to infants without massage. However, the group with sesame oil massage increased in length, midarm and midleg circumferences. The femoral artery blood velocity, diameter and flow improved significantly in the group with sesame oil massage as compared to the control group. Massage also improved the post massage sleep time.

Oxytocin

Agren, C., Lundeberg, T., Uvnas-Moberg, K., & Sato, A. (1995). *The oxytocin antagonist 1-deamino-2-D-Tyr-(Oet)-4-Thr-8-Orn-oxytocin reverses the increase in the withdrawal response latency to thermal, but not mechanical nociceptive stimuli following oxytocin administration or massage-like stroking in rats. Neuroscience Letters, 18, 49-52.*

METHODS: In this study the effect of exogenous oxytocin and of massage-like stroking on the withdrawal latency responses to heat and mechanical nociceptive stimulation were investigated in rats. A hot-plate test was used to assess withdrawal responses. **RESULTS:** Exogenous oxytocin and stroking (a low frequency mechanical stimulation) significantly increased the withdrawal latencies in response to mechanical and to thermal nociceptive stimuli. The effect of oxytocin and of stroking on the hot-plate test was reversed by an oxytocin antagonist directed against the uterine receptor. In contrast, the antagonist did not affect the prolonged response latency in the mechanical nociceptive stimulation test following either exogenous oxytocin or stroking. These results support the view that (1) oxytocin administration affects directly nociceptive-related behavior in response to heat stimulation, and (2) massage-like stroking may have an anti-nociceptive effect via activation of oxytocinergic mechanisms. Since the response to mechanical stimulation was not blocked by the antagonist,

the mechanisms mediating the withdrawal latency to heat and mechanical stimulation could be different.

Kurosawa, M., Lundeberg, T., Agren, G., Lund, I., and Uvnas-Moberg, K. (1995). Massage-like stroking of the abdomen lowers blood pressure in anesthetized rats: influence of oxytocin. *Journal of the Autonomic Nervous System*, 56, 26-30.

METHODS: The aim of this study was to determine how massage-like stroking of the abdomen in rats influences arterial blood pressure. The participation of oxytocinergic mechanisms in this effect was also investigated. The ventral and/or lateral sides of the abdomen were stroked in anesthetized, artificially ventilated rats. Arterial blood pressure was recorded with a pressure transducer via a catheter in the carotid artery. **RESULTS:** Stroking of the ventral, or both ventral and lateral sides of the abdomen for one minute caused a marked decrease in arterial blood pressure. After cessation of the stimulation blood pressure returned to the control level within 1 min. Stroking only the lateral sides of the abdomen elicited a significantly smaller decrease in blood pressure than stroking the ventral side. The decrease in blood pressure caused by stroking was not altered by an oxytocin antagonist. In contrast, the administration of oxytocin diminished the effect, which was antagonized by a simultaneous injection of the oxytocin antagonist. These results indicate that the massage-like stroking of the abdomen decreases blood pressure in anesthetized rats. This effect does not involve intrinsic oxytocinergic transmission. However, since exogenously applied oxytocin was found to diminish the effect of stroking, oxytocin may exert an inhibitory modulatory effect on this reflex arc.

Matthiesen, A.S., Ransjo-Arvidson, A.B., Nissen, E. & Uvnas-Moberg, K. (2001). Postpartum maternal oxytocin release by newborns: effects of infant hand massage and sucking. *Birth*, 28, 13-19.

METHODS: Hand movements and sucking behavior were studied in healthy term newborns who were placed skin-to-skin on their mothers' chests, as well as maternal oxytocin release. Ten vaginally delivered infants whose mothers had not been exposed to maternal analgesia were video-recorded from birth until the first breastfeeding. **RESULTS:** Infants used their hands to explore and stimulate their mother's breast in preparation for the first breastfeeding. When the infants were sucking, the massagelike hand movements stopped and started again when the infants made a sucking pause. Periods of increased massagelike hand movements or sucking of the mother's breast were followed by an increase in maternal oxytocin levels.

Pain

Cutshall, S.M., Wentworth, L.J., Engen, D., Sundt, T.M., Kely, R.F., & Bauer, B.A. (2010). Effect of massage therapy on pain, anxiety, and tension in cardiac surgical patients: a pilot study. *Complementary Therapies in Clinical Practice*, 16, 92-95.

METHODS: A randomized controlled trial comparing outcomes before and after intervention in Patients undergoing cardiovascular surgical procedures. Patients in the intervention group received a 20-minute session of massage therapy intervention between postoperative days 2 and 5.

RESULTS: Decreases in pain, anxiety, and tension scores were observed for patients who received a 20-minute massage compared with those who received standard care.

Field, T., Hernandez-Reif, M., Diego, M., & Fraser, M. (2007). Lower back pain and sleep disturbance are reduced following massage therapy. *Journal of Bodywork and Movement Therapy, 11*, 141-145.

METHODS: Thirty adults (mean age of 41 years) with lower back pain with a duration of at least 6 months participate in the study. Massage therapy sessions were 30 min long twice a week for 5 weeks. 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. **RESULTS:** 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 and chronic fatigue syndrome and suggest that massage therapy is more effective than relaxation therapy for reducing pain and anxiety, and for improving mood.

Hasson, D., Arnetz, B., Jelveus, L., & Edelstam, B. (2004). A randomized clinical trial of the treatment effects of massage compared to relaxation tape recordings on diffuse long-term pain. *Psychother Psychosom., 73*, 17-24.

METHODS: The purpose of this randomized clinical trial was to assess possible effects of massage as compared to listening to relaxation tapes on musculoskeletal pain. 129 patients suffering from long-term musculoskeletal pain were randomized to either a massage or relaxation group, and assessed before, during and after treatment. **RESULTS:** During treatment there was a significant improvement in self-rated health, mental energy, and muscle pain only in the massage group as compared to the relaxation group.

Field, T., Figueiredo, B., Hernandez-Reif, M., Diego, M., Deeds, O. & Ascencio, A. (2008). Massage therapy reduces pain in pregnant women, alleviates prenatal depression in both parents and improves their relationships. *Journal of Bodywork & Movement Therapies, 12*, 146-150.

METHODS: Prenatally depressed women (N=47) were randomly assigned to a group that received massage twice weekly from their partners from 20 weeks gestation until the end of pregnancy or a control group. **RESULTS:** Self-reported leg pain, back pain, depression, anxiety and anger decreased more for the massaged pregnant women than for the control group women. In addition, the partners who massaged the pregnant women versus the control group partners reported less depressed mood, anxiety and anger across the course of the massage therapy period. Finally, scores on a relationship questionnaire improved more for both the women and the partners in the massage group. These data suggest that not only mood states but also relationships improve mutually when depressed pregnant women are massaged by their partners.

Kubsch, S.M., Neveau, T., & Vandertie, K. (2000). Effect of cutaneous stimulation on pain reduction in emergency department patients. *Complementary Therapies in Nursing & Midwifery, 6*, 25-32.

METHODS: Tactile stimulation was used with 50 emergency department patients to relieve pain. Another objective was to determine the effect of tactile stimulation on blood pressure and heart

rate. **RESULTS:** Following stimulation, subjects reported significantly reduced pain, and demonstrated reduced heart rate, and blood pressure readings.

Lemanek, K.L., Ranalli, M., Lukens, C. (2009). A randomized controlled trial of massage therapy in children with sickle cell disease. *Journal of Pediatric Psychology, 34, 1096-1096.*

METHODS: Children and their parents were assigned to a massage therapy or an attention control group. Parents were trained to provide nightly massages. **RESULTS:** Children in the massage therapy group showed higher levels of functional status and lower levels of depression, anxiety and pain.

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Lundeberg, T. (1984). Long-term results of vibratory stimulation as a pain relieving measure for chronic pain. *Pain, 20, 13-23.*

METHODS: 267 patients with chronic neurogenic or musculoskeletal pain were given vibratory stimulation for their pain. The patients were observed for 18 months or until they terminated the treatment. **RESULTS:** About half of the successfully relieved patients (59% of the total number of patients) reported more than 50% pain relief, as scored on a visual analogue and an adjective scale. Seventy-two percent of these patients reported increased social activity and greater than 50% reported reduced intake of analgesic drugs after 12 months of home treatment.

Lundeberg, T., Abrahamsson, P., Bondesson, L., & Haker, E. (1987). Effect of vibratory stimulation on experimental and clinical pain. *Scandinavian Journal of Rehabilitation Medicine, 20, 149-159.*

METHODS: The effect of vibratory stimulation on experimental pain of the skin overlying the right and left extensor carpi radialis longus muscle induced by electrical stimulation was studied in 16 healthy subjects and in 18 patients suffering from chronic epicondylgia of the right elbow. **RESULTS:** In the healthy subjects there were no side differences whereas in the patients, the skin pain threshold over the painful right muscle was lower than that of the left unaffected side under resting conditions. After vibratory stimulation, the skin pain threshold increased bilaterally by 1.1-1.6 times the pre-stimulation threshold in the healthy subjects and by 1.2-2.3 times this threshold in the patients. In 8 of the healthy subjects there was an increase in peripheral blood flow during stimulation and in 8 there was a small decrease. In 13 patients the change in pain threshold was seen in phase with the local increase and decrease in peripheral blood flow. In all individuals, the pain thresholds were regained within 45 minutes of cessation of stimulation. This was in contrast to the general subjective pain in the patients; 12 patients reported that the relief of pain lasted for a period of 1-7 hours.

Lundeberg, T., Abrahamsson, P., & Haker, E. (1987). Vibratory stimulation compared to placebo in alleviation of pain. *Scandinavian Journal of Rehabilitation Medicine, 19, 153-158.*

METHODS: The placebo effect of vibratory stimulation was studied in 72 patients with chronic pain syndromes in a double-blind crossover trial using a vibrator and a "placebo unit". **RESULTS:** Pain alleviation was reported by 48% of the patients during vibratory stimulation compared with 34% for placebo treatment.

Nixon, M., Teschendorff, J., Finney, J., & Karnilowicz, W. (1997). Expanding the nursing repertoire: The effect of massage on post-operative pain. *Australian Journal of Advanced Nursing, 14*, 21-26.

METHODS: A treatment group of 19 patients and a control group of 20 patients were compared on the impact of massage therapy on patients' perceptions of post-operative pain. **RESULTS:** Controlling for age, the results indicated that massage produced a significant reduction in patients' perceptions of pain over a 24 hour period.

Piotrowski, M.M., Paterson, C., Mitchinson, A., Kim, H.M., Kirsh, M., Hinshaw, D.B. (2003). Massage as adjuvant therapy in the management of acute postoperative pain: a preliminary study in men. *Journal of the American College of Surgeons, 197*, 1037-1046.

METHODS: This prospective randomized clinical trial compared pain relief after major operations in 202 patients who received one of three nursing interventions: massage, focused attention, or routine care. Interventions were performed twice daily starting 24 hours after the operation through postoperative day 7. Perceived pain was measured each morning. **RESULTS:** The rate of decline in the unpleasantness of postoperative pain was accelerated by massage. Use of opioid analgesics was not altered significantly by the interventions.

Van den Dolder, P.A., & Roberts, D.L. (2003). A trial into the effectiveness of soft tissue massage in the treatment of shoulder pain. *The Australian Journal of Physiotherapy, 49*, 183-188.

METHODS: The purpose of this single blinded randomized controlled trial was to investigate the effects of soft tissue massage on range of motion, reported pain and reported function in patients with shoulder pain. Twenty-nine patients referred to physiotherapy for shoulder pain were randomly assigned to a treatment group that received six treatments of soft tissue massage around the shoulder (n = 15) or to a control group that received no treatment while on the waiting list for two weeks (n = 14). Measurements were taken both before and after the experimental period by a blinded assessor. Active range of motion was measured for flexion, abduction and hand-behind-back movements. Pain was assessed with the Short Form McGill Pain Questionnaire (SFMPQ) and functional ability was assessed with the Patient Specific Functional Disability Measure (PSFDM). **RESULTS:** The treatment group showed significant improvements in range of motion compared with the control group for abduction, flexion and hand-behind-back. Massage reduced pain as reported on the descriptive section of the SFMPQ by a mean of 5 points and on the visual analogue scale by an average of 27 mm, and it improved reported function on the PSFDM by a mean of 9 points.

Walach, H., Guthlin, C., & Konig, M. (2003). Efficacy of massage therapy in chronic pain: A pragmatic randomized trial. *Journal of Alternative and Complement Medicine, 9*, 837-846.

METHODS: Classic massage was compared to standard medical care (SMC) in chronic pain conditions of back, neck, shoulders, head and limbs. Pain was rated at pretreatment, post-treatment, and 3 month follow-up, as well as pain adjective list, depression, anxiety, mood, and body concept. **RESULTS:** 29 patients were randomized, 19 to receive massage, 10 to SMC. Pain improved significantly in both groups, but only in the massage group was it still significantly improved at follow-up. Depression and anxiety were improved significantly by both treatments, yet only the massage group maintained

at follow-up.

Wang, H.L., & Keck, J.F. (2004). Foot and hand massage as an intervention for postoperative pain. *Pain Management Nursing*, 5, 59-65.

METHODS: The purpose of this pretest-posttest design study was to investigate whether a 20-minute foot and hand massage (5 minutes to each extremity), which was provided 1 to 4 hours after a dose of pain medication, would reduce pain perception and sympathetic responses among postoperative patients. **RESULTS:** Participants reported decreases in pain intensity. Decreases in sympathetic responses to pain (i.e., heart rate and respiratory rate) were observed although blood pressure remained unchanged. The patients experienced moderate pain after they received pain medications.

Parkinson's

Hernandez-Reif, M., Field, T., Largie, S., Cullen, C., Beutler, J., Sanders, C., Weiner, W., Rodriguez-Bateman, D., Zelaya, L., Schanberg, S. & Kuhn, C. (2002). Parkinson's disease symptoms are reduced by massage therapy and progressive muscle exercises. *Journal of Bodywork and Movement Therapies*, 6, 177-182.

METHODS: Sixteen adults diagnosed with idiopathic Parkinson's Disease, received 30-minute massage therapy or progressive muscle relaxation sessions twice a week for five weeks (10 sessions total). **RESULTS:** Physicians rated massage therapy participants as improved in daily living activities by the end of the study. Participants also rated themselves as improved in daily functioning including having more effective and less disturbed sleep.

Perineal Massage

Davidson, K., Jacoby, S., & Brown, M.S. (2000). Prenatal perineal massage: preventing lacerations during delivery. *JOGNN - Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 29, 474-479.

METHODS: To investigate the associations between perineal lacerations and 13 variables associated with the incidence of perineal lacerations 368 women were assessed. **RESULTS:** When parity was controlled, the only factors independently associated with the seriousness of lacerations were parity and prenatal perineal massage.

Labrecque, M., Eason, E., & Marcoux, S. (2001). Women's views on the practice of prenatal perineal massage. *British Journal of Obstetrics & Gynaecology*, 108, 499-504.

METHODS: 763 women received perineal massage during pregnancy. Based on a factor analysis, 17 of the questions were classified into four categories: acceptability of perineal massage (8 items); preparation for birth (4 items); relationship with the partner (2 items); and effect of massage on delivery (3 items). The last two questions asked whether women would perform the massage in their next pregnancy and whether they would recommend perineal massage to another pregnant woman. **RESULTS:** Pain and technical problems reported during the first week or two of massage tended to disappear after a few weeks. Women's assessment of the effect of massage on preparation for birth and on delivery was positive. Women's views about the effect on their relationship with their partner were either positive or negative and were proportional to the partner's participation with the massage. Most women said they would massage again if they were to have another pregnancy

and would recommend it to another pregnant woman.

Physicians' Perspectives

Verhoef, M.J., & Page, S.A. (1998). Physicians' perspectives on massage therapy. *Canadian Family Physician, 44*, 1018-1040.

METHODS: The purpose of this study was to examine the knowledge, opinions, and referral behavior of family physicians with respect to massage therapy and to explore factors associated with referral. Three hundred family physicians were mailed a survey containing questions about sociodemographic and practice characteristics, perceived knowledge of massage therapy, opinions about the usefulness and legislation (government regulations) of massage therapy, and referral behavior. **RESULTS:** Fifty-four percent of physicians completed the questionnaire. Sixty-eight percent of respondents indicated they had minimal or no knowledge. Of the remaining, most (83%) believed massage therapy was a useful adjunct to their own practice. Moreover, 71% had referred patients to massage therapists and most (72%) perceived increasing demand from their patients for massage therapy. Approximately half of the physicians surveyed supported government regulation of massage therapy. Thus, the physicians demonstrated a discrepancy between their knowledge of massage therapy and their opinions of, and referrals to, the profession. Physicians who referred patients to massage therapists generally held more positive opinions and had more knowledge of the discipline.

Physiology

Delaney, J.P., Leong, K.S., Watkins, A., & Brodie, D. (2002). The short-term effects of myofascial trigger point massage therapy on cardiac autonomic tone in healthy subjects. *Journal of Advanced Nursing, 37*, 364-371.

METHODS: The effects of myofascial trigger-point massage therapy to the head, neck and shoulder areas were measured on cardiac autonomic tone on 30 healthy subjects. A 5-minute cardiac interbeat interval recording, systolic and diastolic blood pressure and subjective self-evaluations of muscle tension and emotional state were taken before and after intervention. Autonomic function was measured using time and frequency domain analysis of heart rate variability. **RESULTS:** Following myofascial trigger-point massage therapy there was a significant decrease in heart rate, systolic blood pressure and diastolic blood pressure. Analysis of heart rate variability revealed a significant increase in parasympathetic activity following myofascial trigger-point massage therapy. Additionally both muscle tension and emotional state showed significant improvement.

Diego, M.A., Field, T., Sanders, C., & Hernandez-Reif, M. (2004). Massage therapy of moderate and light pressure and vibrator effects on EEG and heart rate. *International Journal of Neuroscience, 114*, 31-44.

METHODS: Three types of commonly used massage therapy techniques were assessed in a sample of 36 healthy adults, randomly assigned to a: (1) moderate massage, (2) light massage, or (3) vibratory stimulation group. Changes in anxiety and stress were assessed, and EEG and EKG were recorded. **RESULTS:** Anxiety scores decreased for all groups, but the moderate pressure massage group reported the greatest decrease in stress. The moderate massage group also experienced a decrease in heart rate and EEG changes including an increase in delta and a decrease in alpha and

beta activity, suggesting a relaxation response. Finally, this group showed increased positive affect, as indicated by a shift toward left frontal EEG activation. The light massage group showed increased arousal, as indicated by decreased delta and increased beta activity and increased heart rate. The vibratory stimulation group also showed increased arousal, as indicated by increased heart rate and increased theta, alpha, and beta activity.

Posttraumatic Stress

Field, T., Seligman, S., Scafidi, F., & Schanberg, S. (1996). Alleviating posttraumatic stress in children following Hurricane Andrew. *Journal of Applied Developmental Psychology, 17, 37-50.*

METHODS: Massage therapy was evaluated for the reduction of anxiety and depression levels of children as measured by behavioral observations, their drawings, and their cortisol levels. Sixty 1st-5th graders who showed classroom behavior problems following Hurricane Andrew were randomly assigned to a massage therapy or a video attention group. **RESULTS:** Scores on the Posttraumatic Stress Disorder Index suggest that the subjects were experiencing severe posttraumatic stress. Subjects who received massage reported being happier and less anxious and had lower salivary cortisol levels after the therapy than the video subjects. The massage group showed more sustained changes as manifested by lower scores for anxiety, depression, and self-drawings. The massage therapy subjects were also observed to be more relaxed.

Pregnancy

Field, T., Hernandez-Reif, M., Hart, S., Theakston, H., Schanberg, S., Kuhn, C. & Burman, I. (1999). Pregnant women benefit from massage therapy. *Journal of Psychosomatic Obstetrics & Gynecology, 20, 31-38.*

METHODS: Twenty-six pregnant women were assigned to a massage therapy or a relaxation therapy group for 5 weeks. The therapies consisted of 20-min sessions twice a week. **RESULTS:** Both groups reported feeling less anxious after the first session and less leg pain after the first and last session. Only the massage therapy group, however, reported reduced anxiety, improved mood, better sleep and less back pain by the last day of the study. In addition, urinary stress hormone levels (norepinephrine) decreased for the massage therapy group, and the women had fewer complications during labor and their infants had fewer postnatal complications (e.g., less prematurity).

Norheim, A.J., Pederson, E.J., Fonnebo, V., & Berge, L. (2001). Acupressure treatment of morning sickness in pregnancy. A randomized, double-blind, placebo-controlled study. *Scandinavian Journal of Primary Health Care, 19, 43-47.*

METHODS: The purpose of this study was to find out whether acupressure wristband could alleviate nausea and vomiting in early pregnancy. Symptoms were recorded according to intensity, duration and nature of complaints in 97 pregnant women of 8-12 weeks gestation. **RESULTS:** 71% of women in the intervention group reported both less intensive morning sickness and reduced duration of symptoms.

Werntoft, E., & Dykes, A.K. (2001). Effect of acupressure on nausea and vomiting during pregnancy. A randomized, placebo-controlled, pilot study. *The Journal of Reproductive Medicine, 46, 835-839.*

METHODS: The purpose of this study was to compare the anti-emetic effect of acupressure in a group of healthy women with normal pregnancy and nausea and vomiting during pregnancy with a similar group receiving acupressure at a placebo point and another, similar group not receiving any treatment. **RESULTS:** Relief from nausea appeared one day after starting treatment in both the acupressure and placebo groups. The acupressure group experienced significantly less nausea after 14 days as compared to the other two groups.

Field, T., Hernandez-Reif, M., & Diego, M. (2006). Newborns of depressed mothers who received moderate versus light pressure massage during pregnancy. *Infant Behavior and Development, 29, 54-58.*

METHODS: Sixty-four neonates (M age=6.8 days) of depressed mothers who received moderate pressure massage versus light pressure massage therapy during pregnancy (month 5 through month 8) were compared on their behaviors during 15-min observations and on their performance on the Brazelton Neonatal Behavior Assessment Scale. **RESULTS:** The group of neonates whose mothers received moderate pressure massage spent a greater percent of the observation time smiling and vocalizing, and they received better scores on the orientation, motor, excitability, and depression clusters of the Brazelton scale.

Field, T., Hernandez-Reif, M., Feijo, L., & Freedman, J. (2006). Prenatal, perinatal and neonatal supplemental stimulation: A survey of neonatal nurseries. *Infant Behavior and Development, 29, 24-31.*

METHODS: A recent survey was conducted on stimulation of mothers and babies during pregnancy and the neonatal period. The survey was responded to by 82 neonatology staff members from Neonatal Intensive Care Units (NICUs) at hospitals in the United States. **RESULTS:** Some forms of stimulation were extremely common including (1) skin-to-skin following birth in the delivery room (83% of hospitals); (2) containment (swaddling and surrounded by blanket rolls) in the NICU (86%); (3) music in the NICU (72%); (4) rocking in the NICU (85%); (5) kangaroo care (98%); (6) non-nutritive sucking during tube feedings in the NICU (96%); and (7) breastfeeding in the NICU (100%). Other forms of stimulation occurred less frequently including (1) pregnancy massage (19%); (2) labor massage (30%); (3) the Doula (assistant who comforts during labor and delivery) (30%); (4) waterbeds in the NICU (23%); and (5) preterm infant massage in the NICU (38%).

Field, T. (2008) Pregnancy and Labor Alternative Therapy Research. *Alternative Therapies in Health and Medicine, 14, 28-34.*

This review covers research from the last 5 years on the most popular complementary and alternative therapies used during pregnancy and labor and potential underlying biological bases for their effects. MEDLINE was searched and papers were reviewed for the most popular complementary and alternative therapies used during pregnancy and labor, including massage therapy,

acupuncture, relaxation, yoga, and exercise. The pregnancy research generally suggests that alternative therapies have been effective for reducing pregnancy-related back and leg pain and nausea and for reducing depression and cortisol levels and the associated prematurity rate. The labor research generally shows that alternative therapies reduce pain and thereby the need for medication.

Prematurity

Field, T. Diego, M., & Hernandez-Reif, M. (2008). Prematurity and Potential Predictors. *International Journal of Neuroscience*, 118, 277-289.

Prematurity continues to be the leading cause of neonatal death and developmental disability, highlighting the importance of identifying potential predictors of prematurity as well as interventions that can be linked to the predictors. This review covers recent research on potential psychological, physiological, and biochemical predictors. Among the psychological stressors are depression, anxiety, difficult relationships, and lack of social support. Biochemical predictors include corticotropin-releasing hormone, cortisol, and fetal fibronectin. A program of research that links an intervention for prematurity with a predictor for prematurity, that is, massage therapy to reduce cortisol and, in turn, reduce prematurity, is then presented.

Procianoy, R.S., Mendes, E.W. & Silveira, R.C. (2010). Massage therapy improves neurodevelopmental outcome at two years corrected age for very low birth weight infants. *Early Human Development*, 86, 7-11.

METHODS: Newborns with very low birthweight and gestational age were randomly assigned to massage therapy by mothers plus skin-to-skin care (Intervention Group) or just skin-to-skin care (Control Group) during their hospital stay. **RESULTS:** The Intervention Group had borderline higher Psychomotor Development Index and Mental Development Index scores than the Control Group.

Premenstrual Syndrome

Hernandez-Reif, M., Martinez, A., Field, T., Quintero, O., & Hart, S. (2000). Premenstrual syndrome symptoms are relieved by massage therapy. *Journal of Psychosomatic Obstetrics & Gynecology*, 21, 9-15.

METHODS: Twenty-four women with premenstrual syndrome were randomly assigned to a massage therapy or a relaxation therapy group. **RESULTS:** The massage group showed decreases in anxiety, depressed mood and pain immediately after the massage sessions. In addition, by the last day of the study the massage therapy group reported a reduction in menstrual distress symptoms including pain and water retention. These data suggest that massage therapy is effective for treating premenstrual syndrome.

Preschool Massage

Field, T., Kilmer, T., Hernandez-Reif, M. & Burman, I. (1996). Preschool children's sleep and wake behavior: Effects of massage therapy. *Early Child Development and Care*, 120, 39-44.

METHODS: Preschool children received 20-minute massages twice a week for five weeks. **RESULTS:** The massaged children as compared to children in the wait-list control group had better behavior ratings on state, vocalization, activity and cooperation after the massage sessions on the first and last days of the study. Their behavior was also rated more optimally by their teachers by the end of the study. Also, at the end of the 5 week period parents of the massaged children rated their children as having less touch aversion and being more extraverted. Finally, the massaged children had a shorter latency to naptime sleep by the end of the study.

Hart, S.; Field, T.; Hernandez-Reif, M.; & Lundy, B. (1998). Preschoolers' cognitive performance improves following massage. *Early Child Development and Care, 143, 59-64.*

METHODS: This study examined the effects of massage therapy on the cognitive performance of preschool students on the Block Design, Animal Pegs, and Mazes subtests of the Wechsler Preschool and Primary Scale of Intelligence (WPPSI) prior to and following a 15-min massage. **RESULTS:** Children's scores on the Block Design test of abstract reasoning improved following massage. Massage was particularly beneficial to children rated as high-strung and anxious.

Preterm Infants

Field, T., Schanberg, S., Scafidi, F., Bauer, C., Vega-Lahr, N., Garcia, R., Nystrom, J., & Kuhn, C. (1986). Tactile/kinesthetic stimulation effects on preterm neonates. *Pediatrics, 77, 654-658.*

METHODS: Tactile/kinesthetic stimulation was given to 20 preterm neonates (mean gestational age, 31 weeks; mean birth weight, 1,280 g; mean time in neonatal intensive care unit, 20 days) during transitional ("grower") nursery care, and their growth, sleep-wake behavior, and Brazelton scale performance was compared with a group of 20 control neonates. The tactile/kinesthetic stimulation consisted of body stroking and passive movements of the limbs for three, 15-minute periods per day for 10 days. **RESULTS:** The stimulated neonates averaged a 47% greater weight gain per day (mean 25 g versus 17 g), were more active and alert during sleep/wake behavior observations, and showed more mature habituation, orientation, motor, and range of state behavior on the Brazelton scale than control infants. Finally, their hospital stay was 6 days shorter, yielding a cost savings of approximately \$3,000 per infant. These data suggest that tactile/kinesthetic stimulation may be a cost effective way of facilitating growth and behavioral organization even in very small preterm neonates.

Scafidi, F., Field, T., Schanberg, S., Bauer, C., Vega-Lahr, N., & Garcia, R. (1986). Effects of tactile/kinesthetic stimulation on the clinical course and sleep/wake behavior of preterm neonates. *Infant Behavior and Development, 9, 91-105.*

METHODS: Forty preterm neonates treated in an intensive care nursery (M gestational age = 31 weeks, M birthweight = 1274 gms) were randomly assigned to a treatment or control group. The treatment infants received tactile/kinesthetic stimulation (body massage and passive movements of the limbs) for three 15-minute periods during three consecutive hours for a 10-day period. At the end of the treatment period the behavioral states and activity level of the neonates were monitored during sleep/wake behavior observations. In addition, neonatal behaviors were assessed on the Brazelton scale. **RESULTS:** The treated infants averaged a 47% greater weight gain per day (25 vs. 17 grams),

and spent more time awake and active during sleep/wake behavior observations. On the Brazelton scale the treated infants showed more mature orientation, motor, habituation, and range of state behaviors. Finally, the treated infants were discharged 6 days earlier, yielding hospital cost savings of \$3,000 per infant.

Field, T., Scafidi, F., and Schanberg, S. (1987). Massage of preterm newborns to improve growth and development. *Pediatric Nursing, 13, 385-387.*

METHODS: The data reviewed here suggest that the growth and development of preterm neonates can be facilitated by tactile-kinesthetic stimulation. **RESULTS:** Greater weight gain and superior performance on developmental assessments persisted across the first 6 months for the group of infants that received the massage treatment. These enduring effects may be mediated by better parent-infant interactions. Heightened responsiveness of the neonate may enhance the early parent-infant relationships which may, in turn, contribute to optimal growth and development at later stages in infancy.

Field, T. & Schanberg, S. M. (1990). Massage alters growth and catecholamine production in preterm newborns. Gunzenhauser, N., Brazelton, T. B., and Field, T. Johnson & Johnson. *Advances in Touch. Skillman, N. J.*

METHODS: Forty medically stable preterm neonates received tactile/kinesthetic stimulation for three 15-minute periods during three consecutive hours every day for ten days. **RESULTS:** Despite similar formula and caloric intake, the treatment infants averaged a 21 percent greater daily weight gain than the control infants over the treatment period. In addition, the treatment group showed superior performance on the NBAS on the habituation cluster following the treatment period, and less time in active sleep and less facial grimacing, mouthing/yawning, and clenched fists.

Scafidi, F.A., Field, T.M., Schanberg, S.M., Bauer, C.R., Tucci, K., Roberts, J., Morrow, C., & Kuhn, C. M. (1990). Massage stimulates growth in preterm infants: A replication. *Infant Behavior and Development, 13, 167-188.*

METHODS: Forty preterm infants (M gestational age = 30 weeks; M birthweight = 1176 gms; M duration ICU care = 14 days) were assigned to treatment and control groups once they were considered medically stable. Assignments were based on a random stratification of gestational age, birthweight, intensive care duration, and study entrance weight. The treatment infants (n = 20) received tactile/kinesthetic stimulation for three 15-minute periods during 3 consecutive hours per day for a 10-day period. Sleep/wake behavior was monitored and Brazelton assessments were performed at the beginning and at the end of the treatment period. **RESULTS:** The treated infants averaged a 21% greater weight gain per day (M=34 vs. 28 gms) and were discharged 5 days earlier. No significant differences were demonstrated in sleep/wake states and activity level between the groups. The treated infants' performance was superior on the habituation cluster items of the Brazelton scale. Finally, the treatment infants were more active during the stimulation sessions than during the nonstimulation observation sessions (particularly during the tactile segments of the sessions).

Kuhn, C., Schanberg, S., Field, T., Symanski, R., Zimmerman, E., Scafidi, F., and Roberts, J. (1991). Tactile kinesthetic stimulation effects on sympathetic and adrenocortical function in preterm infants. *Journal of Pediatrics*, 119, 434-440.

METHODS: The purpose of this study was to investigate the neuroendocrine response in preterm infants to a pattern of tactile-kinesthetic stimulation that facilitates their growth and development. Preterm infants (mean gestational age 30 weeks, mean birth weight 1176 gm) received normal nursery care or tactile-kinesthetic stimulation for three 15 minute periods at the start of three consecutive hours each day for 10 days. On day 1 and day 10 of the study, a 24-hour urine sample was collected for norepinephrine, epinephrine, dopamine, cortisol, and creatinine assays and a blood sample was taken by heelstick for cortisol and growth hormone assays. **RESULTS:** Urine norepinephrine and epinephrine values increased significantly only in the stimulated babies. Urine dopamine and cortisol values increased in both groups, and serum growth hormone decreased in both groups. Individual differences in urine norepinephrine, epinephrine, dopamine, and cortisol values were highly stable across the 10 days despite a 10-fold range of values among the infants. The results of this study suggest that tactile-kinesthetic stimulation of preterm infants has a fairly specific effect on maturation and/or activity of the sympathetic nervous system. In addition, this study has defined catecholamine and cortisol secretion across gestational age in normal preterm infants. Finally, these data suggest that highly stable individual levels of catecholamine and cortisol secretion are established by birth in humans.

Morrow, C. J., Field, T., Scafidi, F. A., Roberts, J., Eisen, L., Larson, S.K., Hogan, A.E., & Bandstra, E. S. (1991). Differential effects of massage and heelstick procedures on transcutaneous oxygen tension in preterm neonates. *Infant Behavior and Development*, 14, 397-414.

METHODS: This study investigated the effects of heelsticks and tactile-kinesthetic massage on transcutaneous oxygen tension (TcPO₂) in 47 stabilized preterm neonates (average gestational age 30 weeks). **RESULTS:** During the heelstick procedure, TcPO₂ significantly declined an average of 14 mmHg. When compared with the tactile-kinesthetic massage, TcPO₂ levels during the heelstick were significantly lower than during the stimulation. Mean TcPO₂ levels remained clinically safe during the 4 massage sessions. The TcPO₂ levels during kinesthetic stimulation were somewhat more varied, and movement and pressurization of the TcPO₂ electrode were investigated as possible artifactual explanations for this phenomenon. Overall, findings indicate that social forms of touch such as tactile-kinesthetic massage do not appear to have a medically compromising effect on TcPO₂ in the preterm neonate. Findings are evaluated in relation to the "minimal touch" policy.

Scafidi, F. A., Field, T., & Schanberg, S. M. (1993). Factors that predict which preterm infants benefit most from massage therapy. *Journal of Developmental & Behavioral Pediatrics*, 14, 176-180.

METHODS: Ninety-three preterm infants (M gestational age = 30 weeks; M birthweight = 1204 g; M ICU duration = 15 days) were randomly assigned to a massage therapy group or a control group once they were considered medically stable. The treatment group (N = 50) received three daily 15-minute massages for 10 days. **RESULTS:** The massage therapy infants gained more weight per day (M=32 vs. 29 g) than the control infants. The treatment and control groups were divided into high and

low weight gainers based on the average weight gain for the control group. Seventy percent of the massage therapy infants were classified as high weight gainers whereas only 40% of the control infants were classified as high weight gainers. Discriminant function analyses determining the characteristics that distinguished the high from the low weight gainers suggested that the control infants who, before the study, consumed more calories and spent less time in intermediate care gained more weight. In contrast, for the massage therapy group, the pattern of greater caloric intake and more days in intermediate care before the study period along with more obstetric complications differentiated the high from the low weight gainers, suggesting that the infants who had experienced more complications before the study benefited more from the massage therapy. These variables accurately predicted 78% of the infants who benefited more from the massage therapy.

Wheeden, A., Scafidi, F. A., Field, T., Ironson, G., Valdeon, C., and Bandstra, E. (1993). Massage effects on cocaine-exposed preterm neonates. *Journal of Developmental & Behavioral Pediatrics, 14, 318-322.*

METHODS: Thirty preterm cocaine-exposed preterm neonates (mean gestational age = 30 weeks, mean birth weight = 1212 g, mean intensive care unit duration = 18 days) were randomly assigned to a massage therapy or a control group as soon as they were considered medically stable. Group assignment was based on a random stratification of gestational age, birth weight, intensive care unit duration, and entry weight into the study. The treatment group (N = 15) received massages for three 15-minute periods 3 consecutive hours for a 10-day period. **RESULTS:** Findings suggested that the massaged infants (1) averaged 28% greater weight gain per day (M=33 vs 26 g), although the groups did not differ in intake (calories or volume), (2) showed significantly fewer postnatal complications and stress behaviors than did control infants, and (3) demonstrated more mature motor behaviors on the Brazelton examination at the end of the 10-day study period.

Whipple, J. (2000). The effect of parent training in music and multimodal stimulation on parent-neonate interactions in the neonatal intensive care unit. *Journal of Music Therapy, 37, 250-268.*

METHODS: This study examined the effects of parent training in music and multimodal stimulation on the quantity and quality of parent-neonate interactions and the weight gain and length of hospitalization of premature and low birthweight (LBW) infants in a Neonatal Intensive Care Unit (NICU). Twenty sets of parents and premature LBW infants participated in the study. Parents in the experimental group received approximately one hour of instruction in appropriate uses of music, multimodal stimulation including massage techniques, and signs of infant overstimulation and techniques for its avoidance. Parent-neonate interactions, specifically parent actions and responses and infant stress and nonstress behaviors, were observed for subjects in both groups. **RESULTS:** Infant stress behaviors were significantly fewer and appropriateness of parent actions and responses were significantly greater for experimental infants and parents than for control subjects. Parents in the experimental group also reported spending significantly more time visiting in the NICU than did parents of control infants.

Field, T. (2001). Massage therapy facilitates weight gain in preterm infants. *Current Directions in Psychological Science, 10, 51-54.*

REVIEW: Studies from several labs have documented a 31 to 47% greater weight gain in preterm

newborns receiving massage therapy (3 15-min. sessions for 5-10 days) compared with standard medical treatment. Although the underlying mechanism for this relationship between massage therapy and weight gain has not yet been established, possibilities that have been explored in studies with both humans and rats include (1) increased protein synthesis, (2) increased vagal activity that releases food-absorption hormones like insulin and enhances gastric motility, and (3) decreased cortisol levels leading to increased oxytocin. In addition, functional magnetic resonance imaging studies are being conducted to assess the effects of touch therapy on brain development.

Ferber, S.G. Kuint, J., Weller, A., Feldman, R., Dollberg, S., Arbel, E., & Kohelet D. (2002). Massage therapy by mothers and trained professionals enhances weight gain in preterm infants. *Early Human Development, 37, 37-45.*

METHODS: This study compared maternal and nonmaternal administration of massage therapy to preterm infants. Healthy, preterm infants assigned to three groups: two treatment groups--one in which the mothers performed the massage, and the other in which a professional female unrelated to the infant administered the treatment. Both these groups were compared to a control group.

RESULTS: Over the 10-day study period, the two treatment groups gained significantly more weight compared to the control group.

Mainous, R.O. (2002). Infant massage as a component of developmental care: past, present, and future. *Holistic Nursing Practice, 16, 1-7.*

REVIEW: Infant massage has been practiced for centuries by segments on the continents of Africa and South America and in the Far East. Infant massage is a relatively new modality in North America. Numerous studies support its use in preterm infants, who have exhibited decreased stress levels, increased weight gain, and improved motor function when compared with non-massaged controls. Research has recently turned to the benefits of massage in the cocaine-exposed population and in those with human immunodeficiency virus. Massage in ill preterms has been targeted for clinical testing.

Mathai, S., Fernandez, A., Mondkar, J., & Kanbur, W. (2002). Effects of tactile-kinesthetic stimulation on preterms: A controlled trial. *Indian Pediatrics, 38, 1091-1098.*

METHODS: The objective of this study was to determine the effects of tactile-kinesthetic stimulation on preterms on physiologic parameters, physical growth and behavioral development. Forty-eight well preterms with birthweights between 1000-2000 grams were randomly assigned to treatment and control groups. Treatment babies received tactile-kinesthetic stimulation in the form of a structured baby massage from day 3 to term corrected age. They were observed for changes in vital parameters (heart rate, respiration, temperature and oxygen saturation) during the first few days of stimulation in hospital. Thereafter, massage was continued at home. Changes in weight, length and head circumference and neuro-behavior (Brazelton Neuro-Behavioral Assessment Scale) were assessed in both groups before, during and after the study period. **RESULTS:** An increase in heart rate (within physiologic range) was seen in the treatment group during stimulation. This group also showed a weight gain of 4.24 g/day more than controls. On the Brazelton Scale the massaged group showed improved scores on the "orientation", "range of state", "regulation of state" and "autonomic stability" clusters at follow-up.

Dieter, J., Field, T., Hernandez-Reif, M., Emory, E.K., & Redzepi, M. (2003). Stable preterm infants gain more weight and sleep less after five days of massage therapy. *Journal of Pediatric Psychology, 28, 403-411.*

METHODS: To determine whether a shorter course of massage therapy leads to greater weight gain in grower nursery preterm infants, massage therapy was provided for preterm neonates over 5 days. **RESULTS:** Massaged infants gained 47% more weight per day than control infants.

Aly, H., Moustafa, M.F., Hassanein, S.M., Massaro, A.N., Amer, H.A., & Patel, K. (2004). Physical activity combined with massage improves bone mineralization in the premature infants: A randomized trial. *Journal of Perinatology, 24, 305-309.*

METHODS: Osteopenia of prematurity is a known source for morbidity in preterm infants. Premature infants have shown favorable outcomes in response to massage and physical activity. This study tested the hypothesis that massage combined with physical activity can stimulate bone formation and ameliorate bone resorption in premature infants. Thirty preterm infants were randomly assigned to either a control group or intervention group. Infants in the intervention group received a daily protocol of combined massage and physical activity. Serum type I collagen C-terminal propeptide (PICP) and urinary pyridinoline crosslinks of collagen (Pyd) were used as indices for bone formation and resorption, respectively. **RESULTS:** In the control group, serum PICP decreased over time, while urinary Pyd increased indicating decreased bone formation and increased bone resorption, respectively. In the intervention group, serum PICP increased over time. Urinary Pyd also increased over time. A combined massage and physical activity protocol improved bone formation (PICP) but did not affect bone resorption (Pyd).

Feijo, L., Hernandez-Reif, M., & Field, T., Burns, W., Valley-Gray, S., and Simco, E. (2006). Mothers' depressed mood and anxiety levels are reduced after massaging their preterm infants. *Infant Behavior and Development, 29, 476-480.*

METHODS: Forty mothers whose preterm infants were about to be discharged from the Neonatal Intermediate Care Nursery (NICU) were randomly assigned to two groups: the first group of mothers conducted preterm infant massage and the second group only observed their preterm infants receiving massage. **RESULTS:** Both groups of mothers had lower depressed mood scores following the session. However, only the group who massaged their infants had lower anxiety scores after the session.

Field, T., Diego, M., Hernandez-Reif, M., Deeds, O., Figueiredo, B. & Ascencio, A. (2006). Moderate Versus Light Pressure Massage Therapy Leads to Greater Weight Gain in Preterm Infants. *Infant Behavior and Development, 29, 574-578*

METHODS: Sixty-eight preterm infants (M GA=30 weeks) were randomly assigned to a moderate or to a light pressure massage therapy group to receive 15 massages three times per day for 5 days.

Behavior state, stress behaviors and heart rate were recorded for 15min before and during the first 15-min therapy session. Weight gain was recorded over the 5-day therapy period. **RESULTS:** The moderate versus light pressure massage group gained significantly more weight per day. During the behavior observations the moderate versus light pressure massage group showed significantly lower increases from the pre-session to the session recording on: (1) active sleep; (2) fussing; (3) crying; (4) movement; and (5) stress behavior (hiccupping). They also showed a smaller decrease in deep sleep, a greater decrease in heart rate and a greater increase in vagal tone. Thus, the moderate pressure massage therapy group appeared to be more relaxed and less aroused than the light pressure massage group which may have contributed to the greater weight gain of the moderate pressure massage therapy group.

Diego, M., Field, T., Hernandez-Reif, M. (2007). Preterm infant massage consistently increases vagal activity and gastric motility. *Acta Paediatrica*, 96, 1588-1591.

METHODS: EKG and EGG were recorded in 80 preterm infants randomly assigned to a moderate pressure massage therapy group or to a standard care control group to assess vagal activity and gastric motility responses to massage therapy. **RESULTS:** Massaged infants exhibited consistent short-term increases in vagal activity and gastric motility on both the first and the last days of the 5-day study that were associated with weight gain during the 5-day treatment period. No changes in basal vagal activity or gastric motility were noted across the 5-day treatment period.

Jain, S., Kumar, P. & Kumar, P. (2006). Prior leg massage decreases pain responses to heel stick in preterm babies. *Journal of Paediatric and Child Health*, 42, 505-508.

METHODS: 13 infants received a 2-min massage of the ipsilateral leg prior to heel stick on the first study sampling and no massage on the next sampling 2-7 days later and 10 infants had the reverse order. The bedside nurse, blinded to the intervention, measured pain, heart rate, respiratory rate, and oxygen saturation prior to massage, after massage, and 5 min after the heelstick. Serum cortisol was measured with the blood sampling. **RESULTS:** In 23 infants there were no adverse physiologic effects of massage. After heel stick, pain and heart rate were increased in the no-massage group compared with the massage group.

Chen, L.L., Su, Y.C., Su, C.H., Lin, H.C., Kuo, H.W. (2008). Acupressure and meridian massage: combined effects on increasing body weight in premature infants. *Journal of Clinical Nursing*, 17, 1174-1181.

METHODS: For 15 minutes per session, one hour before meals and three times daily over 10 days. **RESULTS:** The daily average weight gain of the infants in the massage group was 33 g versus 27 g in the control group. The group difference in weight gain was significant by the second week.

Diego, M., Field, T., Hernandez-Reif, M. (2008). Temperature Increases During Preterm Infant

Massage Therapy. *Infant Behavior and Development*, 31, 149-152.

METHODS: Temperature was assessed in 72 preterm infants randomly assigned to a control or a massage therapy group. **RESULTS:** A greater increase in temperature was noted for preterm infants receiving massage therapy versus a control group, even though the incubator portholes remained open during the 15 min massage therapy session but not for the control group over an equivalent time period.

Diego, M., Field, T., Hernandez-Reif, M., Deeds, O., Ascencio, A. & Begert, G. (2008). Preterm infant massage elicits consistent increases in vagal activity and gastric motility that are associated with greater weight gain. *Acta Paediatrica*, 96, 1588-1591.

METHODS: EKG and EGG were recorded in 80 preterm infants randomly assigned to a moderate pressure massage therapy group or to a standard care control group to assess vagal activity and gastric motility responses to massage therapy. **RESULTS:** Massaged infants exhibited consistent short-term increases in vagal activity and gastric motility on both the first and the last days of the 5-day study that were associated with weight gain during the 5-day treatment period. No changes in basal vagal activity or gastric motility were noted across the 5-day treatment period.

Hernandez-Reif, M., Diego, M., & Field, T. Preterm Infants Show Reduced Stress Behaviors and Activity after 5 days of Massage Therapy. (2008). *Infant Behavior and Development*, 30, 557-561.

METHODS: Preterm infants residing in an NICU were randomly assigned to a massage therapy or to a control group. The preterm infants in the massage therapy group received three 15-min massages each day for 5 consecutive days, with the massages consisting of moderate pressure stroking to the head, shoulders, back, arms and legs and kinesthetic exercises consisting of flexion and extension of the limbs. Infant stress behaviors and activity were recorded on the first and last day of the study. **RESULTS:** Preterm infants receiving massage therapy showed fewer stress behaviors and less activity from the first to the last day of the study. The findings suggest that massage has pacifying or stress reducing effects on preterm infants, which is noteworthy given that they experience numerous stressors during their hospitalization.

Mendes, E.W. & Procianoy, R.S. (2008). Massage therapy reduces hospital stay and occurrence of late-onset sepsis in very preterm neonates. *Journal of Perinatology*, 28, 815-820.

METHODS: Preterm neonates were randomly assigned to a massage or control group. Massages were performed four times a day on the face and limbs. Passive exercising of upper and lower limbs were also done by the mothers. **RESULTS:** Late-onset sepsis was less frequent in the massage group and they were discharged from the hospital 7 days earlier.

Diego, M., Field, T., & Hernandez-Reif, M. (2009). Procedural pain heart rate responses in

massaged preterm infants. *Infant Behavior and Development*, 32, 226-229.

METHODS: Heart rate (HR) responses to the removal of a monitoring lead were assessed in 56 preterm infants who received moderate pressure, light pressure or no massage therapy. **RESULTS:** The infants who received moderate pressure massage therapy exhibited lower increases in HR suggesting an attenuated pain response. The heart rate of infants who received moderate pressure massage also returned to baseline faster than the heart rate of the other two groups, suggesting a faster recovery rate.

Massaro A.N., Hammad, T.A., Jazzo, B., & Aly, H. (2009). Massage with kinesthetic stimulation improves weight gain in preterm infants. *Journal of Perinatology*, 29, 352-357.

METHODS: Medically stable preterm neonates were randomized either to receive no intervention (control), massage therapy alone or massage therapy with kinesthetic stimulation. **RESULTS:** For infants with birthweight>1000 g, average daily weight gain was increased in the intervention groups compared to control. This effect was greater in the group who received both massage and kinesthetic stimulation.

Procianoy, R.S., & Mendes, E.W., & Silveira, R.C. (2009). Massage therapy improves neurodevelopment outcome at two years corrected age for very low birth weight infants. *Early Human Development*, 86, 7-11.

METHODS: preterm infants were randomly assigned to massage therapy by mothers plus skin-to-skin care or just skin-to-skin care during their hospital stay. **RESULTS:** Growth at 2years corrected age was similar in both groups. The massage group had borderline higher motor scores and significantly higher mental scores.

Field, T. (1992). Interventions in early infancy. Special Section: Australian Regional Meeting: Attachment and the relationship between the infant and caregivers. *Infant Mental Health Journal*, 13, 329-336.

REVIEW: This review describes 3 interventions to help infants of high-risk pregnancies and deliveries facilitate attachment both to and from their caregivers. Prenatal intervention included giving high-risk pregnant women video feedback during prenatal ultrasound, which reduced maternal anxiety, obstetric complications, and fetal activity and improved neonatal outcome (increased weight gain, better performance on the Brazelton Neonatal Behavioral Assessment Scale, and decreased irritability). Intervention aimed at reducing stress in the neonatal intensive care unit included providing preterm neonates nonnutritive sucking opportunities to reduce stress during heelsticks and gavage feedings and providing preterm neonates and preterm cocaine-exposed neonates massage therapy, which facilitated weight gain and better performance on the Brazelton scale. Following improved neonatal behavior, infants would be expected to have better interactions with their caregivers.

Field, T. (2001). Massage therapy facilitates weight gain in preterm infants. *Current Directions in Psychological Science*, 10, 51-54.

REVIEW: Studies from several labs have documented a 31 to 47% greater weight gain in preterm newborns receiving massage therapy (three 15-minute sessions for 5-10 days) compared with standard medical treatment. Although the underlying mechanism for this relationship between massage therapy and weight gain has not yet been established, possibilities that have been explored in studies with both humans and rats include (a) increased protein synthesis, (b) increased vagal activity that releases food-absorption hormones like insulin and enhances gastric motility and (c) decreased cortisol levels leading to increased oxytocin. In addition, functional magnetic resonance imaging studies are being conducted to assess the effects of touch therapy on brain development. Further behavioral, physiological, and genetic research is needed to understand these effects of massage therapy on growth and development.

Field, T. (2002). Massage therapy. *Medical Clinics of North America*, 86, 163-171.

REVIEW: The author and other investigators have documented improvement in several medical and psychiatric conditions after massage therapy, including growth in preterm infants, depression and addictive problems, pain syndromes, and immune and autoimmune conditions. Although some potential underlying mechanisms have been explored for the massage therapy-improved clinical condition relationship, including decreased stress (and decreased cortisol), improved sleep patterns, and enhanced immune function, further research is needed in this area.

Preterm neonates

Field, T., Diego, M., Hernandez-Reif, M., Dieter, J., Kumar, A., Schanberg, S. & Kuhn, C. (2008). Insulin and insulin-like growth factor-1 increased in preterm neonates following massage therapy. *Journal of Developmental and Behavioral Pediatrics*, 29, 463-466.

METHODS: Forty-two preterm neonates who averaged 34.6 weeks (M = 29.5 wk gestational age; M birth weight = 1237 g) and were in the "grower" (step-down) nursery were randomly assigned to a massage therapy group (body stroking and passive limb movements for three, 15-minute periods per day for 5 days) or a control group that received the standard nursery care without massage therapy. On Days 1 and 5, the serum collected by clinical heelsticks was also assayed for insulin and IGF-1, and weight gain and kilocalories consumed were recorded daily. **RESULTS:** Despite similar formula intake, the massaged preterm neonates showed greater increases during the 5-day period in (1) weight gain; (2) serum levels of insulin; and (3) IGF-1. Increased weight gain was significantly correlated with insulin and IGF-1. Preterm infants who received massage therapy not only showed greater weight gain but also a greater increase in serum insulin and IGF-1 levels, suggesting that massage therapy might be prescribed for all growing neonates.

Prostatic Massage

Tarhan, F., Orcun, A., Kucukercan, I., Camursoy, N. & Kuyumcuoglu, U. (2005). Effect of prostatic massage on serum complexed prostate-specific antigen levels. *Urology*, 66, 1234-1238.
METHODS: Blood samples were obtained from each patient before and 30 minutes after prostatic massage. **RESULTS:** After prostatic massage, the tPSA and fPSA levels and fPSA/tPSA ratio

increased significantly, and the increase in cPSA was minimal but statistically significant.

Pulmonary Disease

Wu, H.S., Wu, S.C., Lin, J.G., & Lin, L.C. (2004). Effectiveness of acupressure in improving dyspnoea in chronic obstructive pulmonary disease. *Journal of Advanced Nursing, 45, 252-259.*

METHODS: Patients with chronic obstructive pulmonary disease (COPD) suffer from dyspnoea in their daily life and this may be increased by anxiety. 44 patients were randomly assigned either to a true acupoint acupressure or a sham group. The true acupoint acupressure group received a program to decrease dyspnoea. Those in the sham group received acupressure using sham pressure points. Both acupressure programs consisted of five sessions per week lasting 16 minutes per session, extending over 4 weeks for a total of 20 sessions. Before acupressure was initiated and at the conclusion of the 20th session, the Pulmonary Functional Status and Dyspnoea Questionnaire-modified scale and the Spielberger State Anxiety scale were administered, and a 6-minute walking distance test was performed. Physiological indicators of oxygen saturation and respiratory rate were measured before and after every session. **RESULTS:** Pulmonary function and dyspnoea scores, 6-minute walking distance measurements, state anxiety scale scores, and physiological indicators of the true acupoint acupressure group improved significantly compared with those of the sham group.

Renal Disease

Tsay, S.L., Rong, J.R., & Lin, P.F. (2003). Acupoints massage in improving the quality of sleep and quality of life in patients with end-stage renal disease. *Journal of Advanced Nursing, 42, 134-142.*

METHODS: Sleep disturbance is common in patients with end-stage renal disease. The purpose of the present study was to test the effectiveness of acupoints massage for patients with end-stage renal disease and experiencing sleep disturbances and diminished quality of life. A total of 98 end-stage renal disease patients with sleep disturbances were randomly assigned to an acupressure group, a sham acupressure group, and a control group. Acupressure and sham acupressure group patients received acupoints or no acupoints massage three times a week during haemodialysis treatment for a total of 4 weeks. The measures included the Pittsburgh Sleep Quality Index, Sleep Log, and the Medical Outcome Study - Short Form 36. **RESULTS:** There were significant differences between the acupressure group and the control group in Pittsburgh Sleep Quality Index subscale scores of subjective sleep quality, sleep duration, habitual sleep efficiency, sleep sufficiency, and global Pittsburgh Sleep Quality Index scores. Sleep log data revealed that the acupressure group significantly decreased wake time and experienced an improved quality of sleep at night over the control group. Medical Outcome Study - Short Form 36 data also documented that acupressure group patients experienced significantly improved quality of life.

Reviews

Field, T. (1998). *Massage therapy effects. American Psychological Association, 53, 1270-1281.*

REVIEW: Massage therapy is older than recorded time, and rubbing was the primary form of medicine until the pharmaceutical revolution of the 1940's. Popularized again as part of the alternative medicine movement, massage therapy has recently received empirical support for facilitating growth, reducing pain, increasing alertness, diminishing depression, and enhancing

immune function. In this article studies are reviewed that document these effects, and models are proposed for potential underlying mechanisms.

Field, T. (2002). *Massage therapy. Medical Clinics of North America, 86, 163-171.*

REVIEW: The author and other investigators have documented improvement in several medical and psychiatric conditions after massage therapy, including growth in preterm infants, depression and addictive problems, pain syndromes, and immune and autoimmune conditions. Although some potential underlying mechanisms have been explored for the massage therapy-improved clinical condition relationship, including decreased stress (and decreased cortisol), improved sleep patterns, and enhanced immune function, further research is needed in this area.

Field, T., Diego, M., & Hernandez-Reif, M. (2007). *Massage Therapy Research. Developmental Review, 27, 75-89.*

Massage therapy has been notably effective in preventing prematurity, enhancing growth of infants, increasing attentiveness, decreasing depression and aggression, alleviating motor problems, reducing pain, and enhancing immune function. This review covers massage therapy research from the last decade, as an update to the American Psychologist 1998 review paper. Models are presented for potential biochemical and physiological mechanisms underlying the massage therapy effects.

Field, T., Diego, M., & Hernandez-Reif, M. (2010). *Preterm infant massage therapy research: a review. Infant Behavior and Development, 33, 115-124.*

In this paper, preterm infant massage therapy studies are reviewed. Massage therapy has led to weight gain in preterm infants when moderate pressure massage was provided. In studies on passive movement of the limbs, preterm infants also gained significantly more weight, and their bone density also increased. Research on ways of delivering the massage is also explored including using mothers versus therapists and the added effects of using oils. The use of mothers as therapists was effective in at least one study. The use of oils including coconut oil and safflower oil enhanced the average weight gain, and the transcutaneous absorption of oil also increased triglycerides. In addition, the use of synthetic oil increased vagal activity, which may indirectly contribute to weight gain. The weight gain was associated with shorter hospital stays and, thereby, significant hospital cost savings. Despite these benefits, preterm infant massage is only practiced in 38% of neonatal intensive care units. This may relate to the underlying mechanisms not being well understood. The increases noted in vagal activity, gastric motility, insulin and IGF-1 levels following moderate pressure massage are potential underlying mechanisms. However, those variables combined do not explain all of the variance in weight gain, highlighting the need for additional mechanism studies.

Field, T., Diego, M., & Hernandez-Reif, M. (2010). *Moderate pressure is essential for massage therapy effects. International Journal of Neuroscience, 120, 381-385.*

Moderate pressure appears to be necessary for massage therapy effects. Studies comparing moderate and light pressure massage are reviewed and they suggest that growth and development are enhanced in infants and stress is reduced in adults, but only by moderate pressure massage. The stimulation

of pressure receptors leads to increased vagal activity which, in turn, seems to mediate the diverse benefits noted for massage therapy.

Sexual Abuse

Field, T., Hernandez-Reif, M., Hart, S., Quintino, O., Drose, L., Field, T., Kuhn, C., & Schanberg, S. (1997). Sexual abuse effects are lessened by massage therapy. *Journal of Bodywork and Movement Therapies, 1*, 65-69.

METHODS: Women (mean age = 35 years) who had experienced sexual abuse, were given a 30-minute massage twice a week for 1 month. **RESULT:** Immediately after the massage the women reported being less depressed and less anxious and their salivary cortisol levels decreased following the session. Over the 1-month treatment period the massage therapy group experienced a decrease in depression and in life event stress. Although the relaxation therapy control group also reported a decrease in anxiety and depression, their stress hormones did not change, and they reported an increasingly negative attitude toward touch.

Sleep

Field, T., Kilmer, T., Hernandez-Reif, M. & Burman, I. (1996). Preschool Children's Sleep and Wake Behavior: Effects of Massage Therapy. *Early Child Development and Care, 120*, 39-44.

METHODS: Preschool children received 20-minute massages twice a week for five weeks. **RESULTS:** The massaged children as compared to the children in the wait-list control group had better behavior ratings on state, vocalization, activity and cooperation after the massage sessions on the first and last days of the study. Their behavior was also rated more optimally by their teachers by the end of the study. Also, at the end of the 5 week period parents of the massaged children rated their children as having less touch aversion and being more extraverted. Finally, the massaged children had a shorter latency to naptime sleep by the end of the study.

Richards, K.C. (1998). Effect of a back massage and relaxation intervention on sleep in critically ill patients. *American Journal of Critical Care, 7*, 288-299.

METHODS: Critically ill patients are deprived of sleep and its potential healing qualities, although many receive medications to promote sleep. No one has adequately evaluated holistic nonpharmacological techniques designed to promote sleep in critical care practice. This study determined the effects of (1) a back massage and (2) combined muscle relaxation, mental imagery, and a music audiotape on the sleep of older men with a cardiovascular illness who were hospitalized in a critical care unit. Sixty-nine subjects were randomly assigned to a 6-minute back massage (n=24); a teaching session on relaxation and a 7.5 minute audiotape at bedtime consisting of muscle relaxation, mental imagery, and relaxing background music (n=28); or the usual nursing care (controls, n=17). Polysomnography was used to measure 1 night of sleep for each patient and the sleep efficiency index was the primary variable of interest. **RESULTS:** The analyses showed improved quality of sleep in the back-massage group.

Smoking

Hernandez-Reif, M., Field, T., & Hart, S. (1999). Smoking cravings are reduced by self-massage. *Preventive Medicine, 28*, 28-32.

METHODS: Attempts at smoking cessation have been correlated with severe withdrawal symptoms, including intense cigarette cravings, anxiety, and depressed mood. Massage therapy has been shown to reduce anxiety and stress hormones and improve mood. Twenty smokers were randomly assigned to a self-massage treatment or a control group. The treatment group was taught to conduct a hand or ear self-massage during three cravings a day for 1 month. **RESULTS:** Self-reports revealed lower anxiety scores, improved mood, and fewer withdrawal symptoms. In addition, the self-massage group smoked fewer cigarettes per day by the last week of the study. These findings suggest that self-massage may be an effective adjunct treatment for attempting smoking cessation, to alleviate smoking-related anxiety, reduce cravings and withdrawal symptoms, improve mood, and reduce the number of cigarettes smoked.

Spinal Cord Injuries

Diego, M.A., Field, T., Hernandez-Reif, M., Hart, S., Brucker, B., Field, Tory, Burman, I. (2002). Spinal cord patients benefit from massage therapy. *International Journal of Neuroscience, 112*, 133-142.

METHODS: The study assessed the effects of massage therapy on depression, functionality and upper body muscle strength and range of motion on spinal cord injury patients. Twenty spinal cord injury individuals recruited from a medical school outpatient clinic were randomly assigned to a massage therapy or a control group. Patients in the massage therapy group received two-40-minute massage therapy sessions per week for five weeks. Patients in the control group practiced a range of motion exercise routine targeting the arms, neck, shoulders and back two times per week for five weeks. **RESULTS:** 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.

Stress

Field, T. & Diego, M. (2008). Cortisol: The Culprit Prenatal Stress Variable. *International Journal of Neuroscience, 118*, 1181-1205.

Elevated prenatal cortisol has been associated with several negative conditions including aborted fetuses, excessive fetal activity, delayed fetal growth and development, prematurity and low birthweight, attention and temperament problems in infancy, externalizing problems in childhood, and psychopathology and chronic illness in adulthood. Given that maternal prenatal cortisol crosses the placenta and influences other aspects of the prenatal environment, these effects on the fetus and later development are not surprising. Cortisol would appear to be a mediating variable, resulting from prenatal stress in several forms including depression, anxiety, anger, and daily hassles. Cortisol effects are further complicated by its interaction with neurotransmitters such as norepinephrine, which may itself cause premature birth via intrauterine growth deprivation related to uterine artery resistance. Recent research has suggested that cortisol-reducing therapies such as massage therapy can reduce the risk of perinatal complications including prematurity and low birthweight.

Harris, M. & Richards, K.C. (2010). The physiological and psychological effects of slow-stroke back massage and hand massage on relaxation in older people. *Journal of Clinical Nursing, 19*, 917-926.
REVIEW: Slow-stroke back massage and hand massage resulted in physiological or psychological relaxation. The most common protocols were three-minute slow-stroke back massage and 10-minute hand massage.

Osaka, I., Kurihara, Y., Tanaka, K., Nishizaki, H., Aoki, S., Adachi, I. (2009). Endocrinological evaluations of brief hand massages in palliative care. *Journal of Alternative and Complementary Medicine, 15*, 981-985.

METHODS: Inpatients received a 5-minute hand massage. **RESULTS:** According to salivary chromogranin A levels, the massage reduced stress levels.



Stroke

Mok, E., & Woo, C.P. (2004). The effects of slow-stroke back massage on anxiety and shoulder pain in elderly stroke patients. *Complementary Therapies of Nursing Midwifery, 10*, 209-216.

METHODS: This study explored the effect of slow-stroke back massages on anxiety and shoulder pain in hospitalized elderly patients with stroke. The scores were compared for self-reported pain, anxiety, blood pressure, heart rate and pain of two groups of patients before and immediately after, and three days after the intervention. The intervention consisted of ten minutes of slow-stroke back massage (SSBM) for seven consecutive evenings. One hundred and two patients participated in the entire study and were randomly assigned to a massage group or a control group. **RESULTS:** The results revealed

that the massage intervention significantly reduced the patients' levels of pain perception and anxiety. In addition to the subjective measures, all physiological measures (systolic and diastolic blood pressure and heart rate) changed positively, indicating relaxation. The prolonged effect of SSBM was also evident, as reflected by the maintenance of the psycho-physiological parameters three days after the massage. The patients' perceptions of SSBM, determined from a questionnaire, revealed positive support for SSBM for elderly stroke patients.

Substance P

Morhenn, V.B. (2000). Firm stroking of human skin leads to vasodilatation possibly due to the release of substance P. *Journal of Dermatological Science*, 22, 138-44.

METHODS: Eight individuals were given a face massage and skin temperature was measured.

RESULTS: In seven of eight humans tested, an elevation in the skin's temperature was documented after massaging of the cheeks of the face. The elevation of the skin's temperature reached a plateau after about 40 min of massaging and was correlated with visible erythema. This effect could be inhibited by repeated pretreatment of the skin with topical capsaicin, a chemical that results in the release of substance P from peripheral nerve endings. Thus, it appears that the temperature elevation induced by stroking of human skin is controlled, at least in part, by release of the neurotransmitter substance P.

Surgery

Kim, M.S., Cho, K.S., Woo, H., & Kim, J.H. (2001). Effects of hand massage on anxiety in cataract surgery using local anesthesia. *Journal of Cataract & Refractive Surgery*, 27, 884-890.

METHODS: This study comprised 59 patients having cataract surgery. The patients were divided into those having a hand massage 5 minutes before surgery and those not receiving a hand massage. Patients' anxiety levels were measured using the Visual Analog Scale and by assessing systolic blood pressure, diastolic blood pressure, and pulse rate before and after the hand massage and 5 minutes before the end of surgery. Epinephrine, norepinephrine, cortisol, blood sugar levels, neutrophil, and lymphocyte percentages in white blood cells were also measured. **RESULTS:** After the hand massage, the psychological anxiety levels, systolic and diastolic blood pressures, and pulse rate were significantly lower than before the massage. The hand massage significantly decreased epinephrine and norepinephrine levels in the experimental group while epinephrine, norepinephrine, and cortisol levels increased in the control group.

Antoniv, V.R. (2002). Effect of neck massage therapy on the soft tissues after thyroid surgery. *Likarska Sprava*, 93-96.

METHODS: The objectives of this study were to establish validated methods of massage of the neck, to determine its action on the neck structures, and to conduct a comparative evaluation of results of the control and study groups after performing massage. **RESULTS:** In 85% of patients the skin became healthy pink and the cutaneous-and-muscle tone were improved, making the skin smooth and elastic following the massage. Over the first ten days of the massages 48% of subjects demonstrated resolution of the edema and swelling.

Transplants

Smith, M.C., Reeder, F., Daniel, L., Baramée, J., & Hagman, J. (2003). Outcomes of touch therapies during bone marrow transplant. *Alternative Therapies, 9*, 40-49.

METHODS: This study investigated the effects of Therapeutic Touch and massage therapy on the outcomes of engraftment time, complications, and perceived benefits of therapy during bone marrow transplant. Subjects were adult patients on the bone marrow transplant unit of a large urban tertiary care center. Subjects were randomly assigned to 1 of 3 treatment groups: Therapeutic Touch, massage therapy, and a control group called the friendly visit. Subjects (N=88) were stratified by type of transplant (allogeneic or autologous). Twenty-seven subjects received massage therapy; 31 received therapeutic touch; and 30 received a friendly visit. Nurses with expertise in the 2 touch therapies administered them. The interventions of massage therapy, therapeutic touch, and friendly visit were administered according to standardized protocols every third day beginning the day chemotherapy began until discharge from the program. Time for engraftment, complications, and patient perceptions of benefits of therapy were the main outcome measures. **RESULTS:** A significantly lower score for central nervous system or neurological complications was noted for subjects who received massage therapy compared with the control group; however, no differences were found among the 3 groups with respect to the other 10 complication categories or in the total mean score for complications. Patients' perception of the benefits of therapy (total score) was significantly higher for those who received massage therapy compared with the friendly visit control group.

Vagal Activity

Hatayama, T., Kitamura, S., Tamura, C., Nagano, M., & Ohnuki, K. (2008). Facial massage reduced anxiety and negative mood status, and increased sympathetic nervous activity.

***Biomedical Research, 29*, 317-320.**

METHODS: Healthy women received 45 minutes of facial massage. **RESULTS:** Anxiety and negative mood decreased and the low- to high-frequency ratio in heartrate was higher after the massage.

Voice Disorders

Ternstrom, S., Andersson, M., & Bergman, U. (2000). An effect of body massage on voice loudness and phonation frequency in reading. *Logopedics, Phoniatics, Vocology, 25*, 146-150.

METHODS: The effect of massage on voice fundamental frequency and sound pressure level was investigated. Subjects were recorded while reading a 3-min passage of prose text. Then, a 30-min session of massage was administered. Sixteen subjects were given the massage, while 15 controls rested, lying in silence for the same amount of time. The subjects were then recorded reading the same passage again. **RESULTS:** In the post-massage recordings, subjects had lowered their fundamental frequency and sound pressure level.
