AMTA Position Statement Proposal

Date received by Delegate ____01/18/10________________________________

Name of Originator: _Ann Blair Kennedy______________________________

AMTA ID# __91404____

Phone Day: __864-923-4456_____________ Evening: __864-923-4456______

Email: ___abkamta@thekennedys.us______ Fax: ________________________

Name of Delegate: ___Kevin Lynch___________________________________

Phone Day: ____864- 325-8510_____________ Evening: ___864- 325-8510____

Email: ___tarzan50@peoplepc.com _____________ Fax: ________________

BACKGROUND INFORMATION:

Around the world, millions of people play sports and exercise, from the elite professional athlete to the novice just starting a walking program for general health and wellness benefits. Exercise is recommended for everyone. Although other government groups in the past have recommended exercise and fitness, the U.S. Department of Health and Human Services released the first official U.S. Physical Activity Guidelines in October 2008, and these are now the official guidelines of all parts of the U.S. government. The Guidelines indicate that some activity is better than none, and then go on to make several specific recommendations:

1. Moderate amounts of physical activity provide substantial health benefits for all adults. This dose is defined as 150 minutes/week of moderate intensity activity such as walking, or 75 minutes of vigorous activity/week such as jogging or vigorous sports. Furthermore, this moderate dose can be obtained by mixing some days of moderate intensity and some days of vigorous intensity.
2. Additional health benefits can be obtained by doing more than the moderate dose. This higher target is described as 300 minutes of moderate intensity, 150 minutes of vigorous intensity, or combining moderate and vigorous intensity.
3. All adults should participate in 30 minutes of strength building exercise on two days of the week. These exercises should engage all major muscle groups.
4. Children and adolescents should participate in 60 minutes of physical activity each day. Most of this should be moderate to vigorous intensity activity, and should include vigorous activity at least 3 days/week. It also is recommended that children and adolescents participate in muscle-strengthening three days/week and bone-strengthening activities at least three days/week.[1]

Sports massage is intended to improve athletic performance and recovery, and can be utilized by all individuals who participate in any athletic and/or exercise program. Many professional and collegiate athletic programs employ or contract with massage therapists, and sports massage has been sought for many years by athletes of differing backgrounds for multiple reasons.[2, 3, 4, 5] While many professional and collegiate teams employ or contract with professional massage therapists, with the 2008 Physical Activity Guidelines being very clear that activity is essential for people to be healthy, sports massage should be recommended to those individuals who participate in exercise programs as well as professional and collegiate athletes.

Although some research sample sizes are small, and not all are randomized trials, research has shown that in relation to exercise and athletes, massage can:

- Reduce muscle tension[4, 18, 19]
- Help athletes monitor muscle tone[4, 19]
- Promote relaxation[4, 18, 19]

- Reduce muscle hypertonicity[4, 18, 19]
- Increase muscle range of motion[4, 14, 18, 19]
- Improve soft tissue function[4, 18]
- Support recovery from the transient immunosuppression state[6]
- Support the recovery of heart rate variability and diastolic blood pressure after high-intensity exercise.[7]
- Decrease muscle stiffness and fatigue after exercise.[8, 18, 19]
- Improve exercise performance[8, 9, 18, 19]
- Decrease delayed onset muscle soreness[10, 11, 13, 15, 16, 17, 18, 19]
- Be the most efficient intervention for maintaining maximal performance time in subsequent exercise tests when combined with active recovery from maximal exercise.[12]
- Reduce serum creatine kinase post exercise[13]
- Reduce swelling[17, 19]
- Reduce breathing pattern disorders[18]
- Enhance athletic performance[4, 18, 19]
- May help prevent injuries when massage is received regularly[18, 19]

RATIONALE:

Individuals who participate in exercise and athletic programs who seek enhanced performance, faster recovery, and injury prevention, will benefit from massage therapy given by professional massage therapists working within their scope of practice.

The position statement supports the following AMTA Core Values:

- We are a diverse and nurturing community working with integrity, respect and dignity.
- We embrace consistency in education.
- We endorse professional standards.
- We believe in the benefits of massage.

The position statement supports the 10-30 Year Vivid Descriptions of the AMTA:

- The public will view professional massage as an important contribution toward wellness, and will receive massage on a regular basis.
- People recognize the power of touch to affect the mind, body and spirit.
- AMTA is a trusted resource for information and current research about massage therapy.
- There is significant information in scientific literature on the use, safety and effects of therapeutic massage.
- Massage therapy education and practice is evidence-informed.
- Massage therapy is an essential part of integrative health care.
- AMTA is instrumental in creating a climate conducive for members' professional success.
- The value of massage is recognized internationally and AMTA is viewed as a global resource for the massage therapy profession.
- AMTA members are viewed as trusted professionals who abide by the highest standard of ethical behavior.

POSITION STATEMENT:

It is the position of the American Massage Therapy Association (AMTA) that those who participate in athletic training and exercise programs will benefit from massage therapy.

REFERENCES:

1. U.S. Department of Health and Human Services. (2008). *2008 Physical Activity Guidelines for Americans* (ODPHP Publication No. U0036). Washington, D.C.: Government Printing Office.

2. Galloway, S.D., Watt, J.M. (2004). Massage provision by physiotherapists at major athletics events between 1987 and 1998. Br J Sports Med, 38(2):235-6; discussion 237.

BACKGROUND: The equivocal findings in the literature on efficacy of massage makes it difficult to assess the requirement for, or justify the use of, specialist massage personnel at major athletics events. However, the use of massage by athletes during training and competition remains popular.

OBJECTIVES: To quantify the amount of their time that physiotherapists devote to massage treatment at major athletics events in an attempt to determine the importance of this treatment modality, and to examine whether the use of massage at athletics events is changing over time.

METHODS: Data recorded by the head team physiotherapist from 12 major athletics events (national and international events) between 1987 and 1998 were examined. For each event, the data included: total number of treatments administered by the physiotherapist, the treatment modalities used, and the number of attendances for treatment. The amount of massage provided was expressed as a percentage of the total number of treatments for each athletic event, and the pattern of change in use of massage treatment over time was evaluated.

RESULTS: The percentage of time spent providing massage treatment ranged from 24.0% to 52.2% of the total number of treatments made. The overall median percentage of total treatments in the form of massage was 45.2%. No significant increase or decrease in the use of massage as a treatment modality was observed between 1987 and 1998 in the athletics events examined ($p = 0.95$).

CONCLUSIONS: A significant proportion of physiotherapists' time is devoted to the delivery of massage treatment at athletics events. The demand for massage treatment has been steady over the time period, in the events for which data are available, indicating a consistent use of this treatment modality. Given the popularity of massage among athletes, consideration should be given to the use of specialist sports massage staff at major athletics events. Furthermore, it would seem prudent to further investigate the efficacy of the treatment.

3. Nichols, A.W., Harrigan, R. (2006). Complementary and alternative medicine usage by intercollegiate athletes. Clin J Sport Med, 16(3):232-7.

OBJECTIVE: The purpose of this study is to determine the prevalence and types of provider-delivered complementary and alternative medicine (CAM) used by intercollegiate student athletes attending a Division I NCAA University.

DESIGN AND SETTING: Survey methodology within a group of intercollegiate student athletes at a Division I NCAA university during the fall semester of 2004. PARTICIPANTS: All incoming and returning intercollegiate student athletes were invited to participate. Surveys were completed by 309 (122 women, 187 men) of 482 (64.1%) student athletes representing 20 sports (11 women's, 9 men's teams).

MAIN OUTCOME MEASUREMENTS: A 28-item reliable and valid survey instrument that measured the use of provider delivered CAM and allopathic medical care was administered. Data were analyzed using descriptive statistics, chi2 tests, and logistic regressions.

RESULTS: Fifty-six percent of subjects reported using CAM within the past 12 months, including a significantly higher percentage of women (67%) than men (49%) ($P < 0.01$). Massage was the most commonly used type (38%), followed by chiropractic (29%), Lomilomi (14%), and acupuncture (12%). CAM usage overall did not differ significantly by sport, year in college, nor ethnicity. Hawaiian, Samoan, and Tongan subjects were more likely to use the Hawaiian-originated forms of CAM. Sixty percent of respondents have a regular medical doctor, eighty percent of which are family practitioners. Forty-two percent of subjects were referred to a medical specialist within the previous three years.

CONCLUSIONS: CAM usage is common among collegiate student athletes and rates are higher than in adults nationwide and within the state of Hawai'i. This study and future investigations will increase the awareness of CAM use patterns by collegiate athletes, and hopefully improve allopathic physicians' abilities to provide optimal athletic health care.

4. Brukner, P., and Khan, K., with colleagues. (2009). *Clinical Sports Medicine*. Sydney, Australia: The McGraw-Hill Companies.

5. Nyland, J., Nolan, M.F. (2004). Therapeutic modality: rehabilitation of the injured athlete. Clin Sports Med, 23(2):299-313, vii. Review.

   Traditional therapeutic modalities include cryotherapy, sonotherapy, pulsed electrical stimulation, transcutaneous electrical nerve stimulation, high-volt pulsed current, and iotopheresis. Alternative modalities include acupuncture, magnetic field therapy, biofeedback, and massage. All therapeutic modalities should be considered adjuncts to progressive functional exercise. Controlled studies rarely reach consensus regarding the efficacy of therapeutic modalities, so their use should be individualized to the patient.

6. Arroyo-Morales, M., Olea, N., Martínez, M.M., Hidalgo-Lozano, A., Ruiz-Rodríguez, C., Díaz-Rodríguez, L. (2008). Psychophysiological effects of massage-myofascial release after exercise: a randomized sham-control study. J Altern Complement Med, 14(10):1223-9.

   The effectiveness of massage for postexercise recovery remains unclear, despite numerous studies on this issue. The aim of this study was to determine the effect of massage on endocrine and immune functions of healthy active volunteers after intense exercise. After repeated Wingate tests, the effects of whole-body massage and placebo on salivary cortisol, immunoglobulin A (IgA), and total protein levels were compared using a between-group design. Sixty healthy active subjects (23 women, 37 men) underwent 2 exercise protocol sessions at least 2 weeks apart and at the same time of day. The first session familiarized participants with the protocol. In the second session, after a baseline measurement, subjects performed a standardized warm-up followed by three 30-second Wingate tests. After active recovery, subjects were randomly allocated to massage (40-minute myofascial induction) or placebo (40-minute sham electrotherapy) group. Saliva samples were taken before and after the exercise protocols and after recovery. In both groups, the exercise protocol induced a significant increase in cortisol ($p < 0.001$), decrease in salivary IgA (sIgA) ($p < 0.001$), and increase in total proteins ($p = 0.01$) in saliva. Generalized estimating equations showed a significant effect of massage on sIgA rate ($p = 0.05$), a tendency toward significant effect on salivary total protein levels ($p = 0.10$), and no effect on salivary flow rate ($p = 0.55$) or salivary cortisol ($p = 0.39$). The sIgA secretion rate was higher after the recovery intervention than at baseline among women in the massage group ($p = 0.03$) but similar to baseline levels among women in the placebo group ($p = 0.29$). Massage may favor recovery from the transient immunosuppression state induced by exercise in healthy active women, of particular value between high-intensity training sessions or competitions on the same day.

7. Arroyo-Morales, M., Olea, N., Martinez, M., Moreno-Lorenzo, C., Díaz-Rodríguez, L., Hidalgo-Lozano, A. (2008). Effects of myofascial release after high-intensity exercise: a randomized clinical trial. J Manipulative Physiol Ther, 31(3):217-23.

   OBJECTIVE: The usefulness of massage as a recovery method after high-intensity exercise has yet to be established. We aimed to investigate the effects of whole-body massage on heart rate variability (HRV) and blood pressure (BP) after repeated high-intensity cycling exercise under controlled and standardized pretest conditions.

   METHODS: The study included 62 healthy active individuals. After baseline measurements, the subjects performed standardized warm-up exercises followed by three 30-second Wingate tests. After completing the exercise protocol, the subjects were randomly assigned to a massage (myofascial release) or placebo (sham treatment with disconnected ultrasound and magnetotherapy equipment) group for a 40-minute recovery period. Holter recording and BP measurements were taken after exercise protocol and after the intervention.

RESULTS: After the exercise protocol, both groups showed a significant decrease in normal-to-normal interval, HRV index, diastolic BP ($P > .001$), and low-frequency domain values ($P = .006$). After the recovery period, HRV index ($P = .42$) and high-frequency (HF) ($P = .94$) values were similar to baseline levels in the massage group, whereas the HRV index tended ($P = .05$) to be lower and the HF was significantly ($P < .01$) lower vs baseline values in the placebo group, which also showed a tendency ($P = .06$) for HF to be lower than after the exercise. Likewise, diastolic BP returned to baseline levels in the massage group ($P = .45$) but remained lower in the placebo group ($P = .02$).

CONCLUSION: Myofascial release massage favors the recovery of HRV and diastolic BP after high-intensity exercise (3 Wingate tests) to preexercise levels.

8. Ogai, R., Yamane, M., Matsumoto, T., Kosaka, M.(2008). Effects of petrissage massage on fatigue and exercise performance following intensive cycle pedalling. Br J Sports Med, 42(10):834-8.

OBJECTIVE: Petrissage is assumed to influence circulation as well as interstitial drainage of both superficial and deep tissues. To study its effect it was applied between consecutive bouts of supramaximal exercise performed by the lower leg muscles.

METHODS: Subjects were 11 healthy female students actively engaged in sports. Exercise bouts of ergometer cycling at loads determined individually (0.075 kp x body weight (kg)) for 5 s repeated eight times at intervals of 20 s had to be performed twice on an experimental day with 35 min intermittent bed rest. Each subject was investigated on two occasions with a minimum interval of 1 week, once without (control, CO) and once with 10 min petrissage (massage, MA) of the exercising lower leg during the bed rest phase. Effects of exercise bouts on blood lactate, muscle stiffness and perceived lower limb fatigue and their recovery before and after the second exercise bout were determined.

RESULTS: For the first exercise bouts total power did not differ between MA and CO. Courses of blood lactate did not differ between MA and CO. However, recovery from measured muscle stiffness ($p<0.05$) and perceived lower limb fatigue ($p<0.05$) were more pronounced and total power during the second exercise bout was enhanced ($p<0.01$) in MA as compared with CO subjects.

CONCLUSION: Petrissage improved cycle ergometer pedalling performance independent of blood lactate but in correlation with improved recovery from muscle stiffness and perceived lower limb fatigue.

9. 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. J Altern Complement Med, 11(6):1093-101.

OBJECTIVE: Research into the effects of manual massage on physical performance has proved inconclusive, with studies primarily examining the major muscle groups of the lower extremities. Grip performance is essential for object manipulation, as well as for many grip-dependent activities and sports; but there have been no studies to determine the effects of manual massage on immediate grip performance in healthy subjects. The purpose of this study was to assess the effects of using manual massage to improve power-grip performance immediately after maximal exercise in healthy adults.

STUDY DESIGN: This was a pretest/post-test study.

SETTING: The study took place in a suburban allied health school.

SUBJECTS: Fifty-two (52) volunteer massage-school clients, staff, faculty, and students participated. Interventions: 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.

OUTCOME MEASURES: Power-grip measurements (baseline, postexercise, and postintervention) were performed on both hands using a commercial hand dynamometer. These measurements preceded and followed 3 minutes of maximal exercise using a commercial isometric hand exerciser that produced fatigue to 60% of baseline strength.

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. Statistical analyses involving single-factor repeated-measures analyses of variance ($p = 0.05$) with Bonferroni a priori tests ($p = 0.0083$) demonstrated that massage had a greater effect than no massage or than placebo on grip performance after fatigue, especially in the nondominant-hand group.

CONCLUSIONS: Manual massage to the forearm and hand after maximal exercise was associated with greater effects than nonmassage on postexercise grip performance. The present data do support the use of a 5-minute manual massage to assist immediate grip performance after fatigue in healthy subjects.

10. Farr, T., Nottle, C., Nosaka, K., Sacco, P. (2002). The effects of therapeutic massage on delayed onset muscle soreness and muscle function following downhill walking. J Sci Med Sport, 5(4):297-306.

    This study investigated the effects of a therapeutic massage on delayed onset muscle soreness and muscle function following downhill walking. Eight male subjects performed a 40-min downhill treadmill walk loaded with 10% of their body mass. A qualified masseur performed a 30-min therapeutic massage to one limb 2 hours post-walk. Muscle soreness, tenderness, isometric strength, isokinetic strength, and single leg vertical jump height were measured on two occasions before, and 1, 24, 72 and 120 hours post-walk for both limbs. Subjects showed significant ($p < 0.004$) increases in soreness and tenderness for the non-massaged limb 24 hours post-walk with a significant ($p < 0.001$) difference between the two limbs. A significant reduction In isometric strength was recorded for both limbs compared to baseline 1 hour post-walk. Isokinetic strength at 60 degrees/sec and vertical jump height were significantly lower for the massaged limb at 1 and 24 hours post-walk. No significant differences were evident in the remaining testing variables. These results suggest that therapeutic massage may attenuate soreness and tenderness associated with delayed onset muscle soreness. However it may not be beneficial in the treatment of strength and functional declines.

11. Hilbert, J.E., Sforzo, G.A., Swensen, T. (2003). The effects of massage on delayed onset muscle soreness. Br J Sports Med, 37(1):72-5.

    OBJECTIVES: The purpose of this study was to investigate the physiological and psychological effects of massage on delayed onset muscle soreness (DOMS).

    METHODS: Eighteen volunteers were randomly assigned to either a massage or control group. DOMS 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: A two factor ANOVA (treatment v time) with repeated measures on the second factor showed no significant treatment differences for peak torque, ROM, neutrophils, unpleasantness of soreness, and mood ($p > 0.05$). The intensity of soreness, however, was significantly lower in the massage group relative to the control group at 48 h postexercise ($p < 0.05$).

    CONCLUSIONS: Massage administered 2 h after exercise induced muscle injury did not improve hamstring function but did reduce the intensity of soreness 48 h after muscle insult.

12. Monedero, J., Donne, B. (2000). Effect of recovery interventions on lactate removal and subsequent performance. Int J Sports Med, 21(8):593-7.

The recovery process in sport plays an essential role in determining subsequent athletic performance. This study investigated the effectiveness of different recovery interventions after maximal exercise. Eighteen trained male cyclists initially undertook an incremental test to determine maximal oxygen consumption. The four recovery interventions tested were: passive, active (50% maximal oxygen uptake), massage, and combined (involving active and massage components). All test sessions were separated by 2 to 3 days. During intervention trials subjects performed two simulated 5 km maximal effort cycling tests (T1 and T2) separated by a 20 min recovery. Performance time for the tests (t1, t2); blood lactate (BLa) during T1, T2, and every 3 min during recovery; and heart rate (HR) during the recovery intervention and T2 were recorded. Combined recovery was found to be better than passive ($P<0.01$) and either active or massage ($P<0.05$) in maintenance of performance time during T2. Active recovery was the most effective intervention for removing BLa at minutes 9 and 12, BLa removal during combined recovery was significantly better than passive at minute 3, and significantly better than passive, active, and massage at minute 15. In conclusion, combined recovery was the most efficient intervention for maintaining maximal performance time during T2, and active recovery was the best intervention for removing BLa.

13. Smith, L.L., Keating, M.N., Holbert, D., Spratt, D.J., McCammon, M.R., Smith, S.S., Israel, R.G. (1994). The effects of athletic massage on delayed onset muscle soreness, creatine kinase, and neutrophil count: a preliminary report. J Orthop Sports Phys Ther, 19(2):93-9.

    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 ($N = 7$) or control ($N = 7$) 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; cortisol was assessed at similar times. A trend analysis revealed a significant ($p < 0.05$) 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.

14. Crosman, L.J., Chateauvert, S.R., Weisberg, J. (1984). The effects of massage to the hamstring muscle group on range of motion. J Orthop Sports Phys Ther, 6(3):168-72.

    This study was designed to measure the effect on range of motion of a single massage treatment to the hamstring muscle group. Thirty-four normal female subjects between 18 and 35 years of age were given a 9- 12 minute massage treatment to the posterior aspect of one randomly assigned lower extremity. Passive range of motion of both lower extremities was measured by taking the perpendicular distance from the lateral malleolus to the table surface in a straight leg raise and by conventional goniometry for hip flexion and knee extension. Measurements were taken pre-, and post-, and 7-days postmassage treatment. Immediate postmassage increases in range of motion were noted in the test group (massaged) legs with significance at the 0.05 level. The possible use of this treatment in athletics and pathological conditions are discussed.

15. Bakowski, P., Musielak, B., Sip, P., Biegański, G. (2008). Effects of massage on delayed-onset muscle soreness. Chir Narzadow Ruchu Ortop Pol, 73(4):261-5.

    INTRODUCTION: Delayed onset muscle soreness (DOMS) is the pain or discomfort often felt 12 to 24 hours after exercising and subsides generally within 4 to 6 days. Once thought to be caused by lactic acid buildup, a more recent theory is that it is caused by inflammatory process or tiny tears in the muscle fibers caused by eccentric contraction, or unaccustomed training levels. Exercises that involve many eccentric contractions will result in the most severe DOMS.

MATERIAL AND METHODS: Fourteen healthy men with no history of upper arm injury and no experience in resistance training were recruited. The mean age, height, and mass of the subjects were 22.8 +/- 1.2 years, 178.3 +/- 10.3 cm, and 75.0 +/- 14.2 kg, respectively. Subjects performed 8 sets of concentric and eccentric actions of the elbow flexors with each arm according to Stay protocol. One arm received 10 minutes of massage 30 minutes after exercise, the contralateral arm received no treatment. Measurements were taken at 9 assessment times: pre-exercise and postexercise at 10 min, 6, 12, 24, 36, 48, 72 and 96 hours. Dependent variables were range of motion, perceived soreness and upper arm circumference.

RESULTS: There was noticed difference in perceived soreness across time between groups. The analysis indicated that massage resulted in a 10% to 20% decrease in the severity of soreness, but the differences were not significant. Difference in range of motion and arm circumference was not observed.

CONCLUSIONS: Massage administered 30 minutes after exercises could have a beneficial influence on DOMS but without influence on muscle swelling and range of motion.

16. Frey Law, L.A., Evans, S., Knudtson, J., Nus, S., Scholl, K., Sluka, K.A. (2008). Massage reduces pain perception and hyperalgesia in experimental muscle pain: a randomized, controlled trial. J Pain, 9(8):714-21.

Massage is a common conservative intervention used to treat myalgia. Although subjective reports have supported the premise that massage decreases pain, few studies have systematically investigated the dose response characteristics of massage relative to a control group. The purpose of this study was to perform a double-blinded, randomized controlled trial of the effects of massage on mechanical hyperalgesia (pressure pain thresholds, PPT) and perceived pain using delayed onset muscle soreness (DOMS) as an endogenous model of myalgia. Participants were randomly assigned to a no-treatment control, superficial touch, or deep-tissue massage group. Eccentric wrist extension exercises were performed at visit 1 to induce DOMS 48 hours later at visit 2. Pain, assessed using visual analog scales (VAS), and PPTs were measured at baseline, after exercise, before treatment, and after treatment. Deep massage decreased pain (48.4% DOMS reversal) during muscle stretch. Mechanical hyperalgesia was reduced (27.5% reversal) after both the deep massage and superficial touch groups relative to control (increased hyperalgesia by 38.4%). Resting pain did not vary between treatment groups.

PERSPECTIVE: This randomized, controlled trial suggests that massage is capable of reducing myalgia symptoms by approximately 25% to 50%, varying with assessment technique. Thus, potential analgesia may depend on the pain assessment used. This information may assist clinicians in determining conservative treatment options for patients with myalgia.

17. 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(3): 174–180.

CONTEXT: Delayed-onset muscle soreness (DOMS) describes muscle pain and tenderness that typically develop several hours postexercise and consist of predominantly eccentric muscle actions, especially if the exercise is unfamiliar. Although DOMS is likely a symptom of eccentric-exercise–induced muscle damage, it does not necessarily reflect muscle damage. Some prophylactic or therapeutic modalities may be effective only for alleviating DOMS, whereas others may enhance recovery of muscle function without affecting DOMS.

OBJECTIVE: To test the hypothesis that massage applied after eccentric exercise would effectively alleviate DOMS without affecting muscle function.

DESIGN: 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 (before, immediately and 30 minutes after exercise, and 1, 2, 3, 4, 7, 10, and 14 days postexercise) between control and massage conditions.

SETTING: University laboratory.
Patients or Other Participants: Ten healthy subjects (5 men and 5 women) with no history of upper arm injury and no experience in resistance training.
Intervention(s): Subjects performed 10 sets of 6 maximal isokinetic ($90°\cdot s^{-1}$) 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.

MAIN OUTCOME MEASURE(S): Maximal voluntary isometric and isokinetic elbow flexor strength, range of motion, upper arm circumference, plasma creatine kinase activity, and muscle soreness.
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 ($P < .05$). Soreness while flexing the elbow joint ($P = .07$) and palpating the brachialis muscle ($P = .06$) 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 ($P < .05$), and upper arm circumference, with a significantly smaller increase than the control at 3 and 4 days postexercise ($P < .05$). However, no significant effects of massage on recovery of muscle strength and ROM were evident.

CONCLUSIONS: Massage was effective in alleviating DOMS by approximately 30% and reducing swelling, but it had no effects on muscle function.

18. Fritz, S. (2005). *Sports & Exercise Massage: Comprehensive Care in Athletics, Fitness, & Rehabilitation.* St. Louis, Missouri: Elsevier Mosby.

19. Archer, P. (2007). *Therapeutic massage in Athletics*. Philadelphia, Pennsylvania: Lippincott Williams & Wilkins.