

# **SPORTS MASSAGE**

## ***Introduction:***

Whilst massage is being offered more and more as part of medical and therapeutic medicine and is usually gladly accepted by patients (Muiznieks, 1996; Hutson, 1996; Kuprian, 1982; Clews, 1996), the knowledge of massages effectiveness is only partially corroborated by science. We still lack parameters for measurements and proof of its values (Kuprian, 1982; Sawyer and Zbieranek, 1986). It is something the majority of people suspect to be true, but proving it scientifically is needed for influencing the medical and health care professionals (Lovas, 1997).

The use of massage as an aid to physical performance and as a modality for facilitating recovery has survived from antiquity (Harris, 1964; cited in Cafarelli and Flint, 1993). In 1982, Hamann states (cited in Kuprian, 1982) "According to the state of research today, we can assume that there is no exclusively local-mechanical effect of massage, but that the effects are always of a complex nature". More scepticism is seen in earlier articles. It was stated in Sawyer and Zbieranek, 1986 that massage was looked upon with considerable controversy by the medical field. This was indeed fifteen years ago. Research seems to have become much more certain about the effects of massage in more recent years. However our understanding of massage is far from complete and further scientific investigation is certainly needed.

## ***Techniques used in massage:***

The available literature all seems to be in agreement (Goats, 1994; Hutson, 1996; Kuprian, 1982; Anderson and Hall, 1995; Cafarelli and Flint, 1993; Norris, 1993) of the types of massage and associated physiological responses. Each has a specific purpose and in combination can lead to quality results in muscle tone/tension.

The first of these techniques is called 'effleurage', used frequently to begin and end a treatment session. It is composed of light gliding movements over the skin. Producing a sensory reaction, this brings about a state of relaxation and when applied towards the heart, reduces swelling and aids venous return.

'Petrissage', or kneading, consists of pressing and rolling the muscles under the fingers and hands. Through this intensive, vigorous action directed primarily at the muscular system, the goal is to press the metabolic waste products out of the effected areas. Petrissage has been said to increase the local blood supply and increase venous and lymphatic return.

'Tapotement', or percussion, uses sharp alternating hand movements to increase blood flow and stimulate peripheral nerve endings. Doubtlessly this can create a certain preparedness for muscle tensing and contraction in relaxed muscles. Hacking, slapping, beating, cupping, and clapping are various techniques used.

It has become apparent that the type of massage brings about different physiological responses and for the desired effects the correct type must be used. Intensity, tempo, and rhythm all need to be considered as well. For example, light, rapid massage will heighten the senses, leaving the athlete aroused and ready to compete. Slow, firm massage will instill a feeling of well-being, a state of relaxation and even sleepiness (Clews, 1996; Birukov, 1994).

## ***Physiological effects of massage:***

Undoubtedly massage has desirable physiological effects (Starkey, 1993; Camberlain, 1983; Hutson, 1996; Clews, 1996; Anderson & Hall, 1995; Ljungfelt et al., 1994; Strauss, 1994; Cafarelli and Flint, 1993; Mellion, 1994; Dunn, 1996). Some of the common effects stated in the majority of current literature include increased blood flow, increased lymphatic drainage, neural stimulation, encouragement of venous return, relief of pain, injury rehabilitation and relaxation.

### **Blood flow:**

Wakim et al. (1949; cited in Cafarelli and Flint) found that vigorous massage increased peripheral blood flow by 50%, but Ebel and Wisham (1952; cited in Cafarelli and Flint) found that massage had no effect on blood flow in a resting limb. Bell, 1964 (cited in Norris, 1993) reports that deep stroking and kneading for a 10 minute period has been shown to increase blood volume for 40 minutes, and blood pressure has been shown to reduce following back massage (Barr and Taslitz, 1970; cited in Norris, 1993).

Other constituents of blood have been measured following a treatment of massage to try and demonstrate other effects on a physiological process that would be beneficial to exercise performance or recovery. For example, an increase in the number of circulating red blood cells should cause an increase in the oxygen transport capacity (Kresge, 1985; cited in Cafarelli and Flint, 1993). This claim though, is not supported by enough literature to be conclusive. Wakim et al. (1949; cited in Cafarelli and Flint, 1993) reported a small (7%) increase in red blood cells following massage. In contrast, Arrko et al. (1983; cited in Cafarelli and Flint, 1993) found a 2% decrease in haemoglobin concentration.

### **Removal of metabolic waste products:**

Such effects on blood flow also suggest that massage should improve the performance of fatigued muscles (Goats, 1994; Balke, Anthony and Wyatt, 1989; cited in Norris, 1993). Cafarelli and Flint's theory claims that since blood is the medium by which most of the oxygen, carbon dioxide, glucose, free fatty acids, and thermal energy are transported, anything that alters blood flow will have an effect on the rate at which these substances will be delivered and removed.

Plasma concentrations of sodium and potassium, which may be markers of transient fatigue, have also been measured (MacLaren et al. 1988; cited in Cafarelli and Flint, 1993). Plasma potassium concentration has been reported to increase by 4.5% (Arrko et al. 1983) or not at all (Tomasik, 1983; cited in Cafarelli and Flint, 1993).

Goats states (1994) that studies with a radioisotope showed that moderate exercise was a less efficient way to improve blood flow in large muscle groups than tapotement. A study by Weber, Servedio and Woodall (1994), however, concluded that massage immediately following and 24 hours after a high-intensity exercise bout did not reduce or alleviate soreness and force deficits related to delayed onset muscle soreness (DOMS).

The treatment of DOMS has been investigated. Studies in which anti-inflammatory medications have been administered have yielded different results depending on dosage and time of administration. Sub-maximal concentric exercises may alleviate soreness but does not restore muscle function. Neither stretching nor cryotherapy abates the symptoms of DOMS. The effects of massage on the recovery of DOMS has been examined by several researchers. A study conducted by Dolgener and Morien (1993) to determine the effect of massage on lactate disappearance following short-term exhaustive work. It was concluded that massage

following exercise did not remove lactate better than passive recovery or as well as active recovery (cycling at 40% of VO<sub>2</sub> max). In this study and the majority of other similar studies, massage was administered immediately after or at 24 or 48 hours after exercise. The fact that Smith et al. (1992; cited in Gulick and Kimura, 1996) reported a significant reduction in DOMS when the massage was administered 2 hours post exercise may imply that timing is critical. Although a scientific rationale has not been identified, Soviet sports therapists advocated that restorative massage be administered 1-3 hours after exercise (Gulick and Kimura, 1996).

### ***When to use massage:***

Massage is now used by many athletes both pre and post competition, as well as during competitive rest or breaks (Mellion, 1994). Many warm-up regimes include massage but few have actually been evaluated (Goats, 1994). One comparative study cited in Goats (1994) weighed the efficacy of a standard athletic warm-up program against massage or stretching exercises. Stretching exercises produced the greatest flexibility in connective tissue around the joints, although massage had a significant beneficial effect. The warm-up exercises were least beneficial. Post exercise effleurage reduces subsequent muscle soreness by rapidly reducing the concentration of lactate in the muscle cells (Goats, 1994).

Wiktorsson-Moller et al. (1983; cited in Cafarelli and Flint, 1993) found that massage prior to activity actually reduced the ability to generate force. This was measured in maximal voluntary contraction (MVC) which was reduced by 9%. Harmer (1991; cited in Cafarelli and Flint, 1993) found no effect of massage on maximal stride frequency during a sprinting exercise. Other research contradicts this. A study by Ask et al. (1987; cited in Cafarelli and Flint, 1993) showed that maximal muscle power output during leg extension was significantly increased by 11% when the athletes received massage beforehand.

Clews (1996) believes that many sports people like to use massage immediately before training and/or competition. The rationale behind this is that massage at this time provides a final opportunity to prepare the muscles and joints for movement and to enhance athlete's feelings of readiness to perform. This is said to be short of duration, light and stimulating. Athletes soon learn from their own experience whether they prefer this, which is generally agreed upon within available literature.

It is also important massage be carefully integrated into the athlete's entire training and competition programs (Clews, 1996; Cafarelli and Flint, 1993; Strauss, 1994). For example it has been strongly discouraged (Clews, 1996) to present their athletes with their first massage in a long time close to an important competition.

The period between training phases often results in increased muscle fatigue, tightness and soreness. Increasing the frequency of massage leading into and throughout this period of transition may help this problem. This could also be considered during a taper period, not only for the physiological effects but also the psychological benefits, offering the athlete an optimal state of readiness to compete (Clews, 1996; Dunn, 1996).

### ***Lymphatic drainage:***

The effect of massage upon lymph flow has been measured experimentally. Intradermal dye injections have been used to show lymph flow improvements with massage (McMaster, 1937; cited in Norris, 1993). Elkins and associates (cited in Cafarelli and Flint, 1993) exposed the hindquarters of dogs to infrared radiation, shortwave or microwave diathermy, active or passive exercise, or massage for 30 minutes. Lymph flow only increased with kneading and effleurage massage, and active or passive exercise. Other studies (Ladd and Blanchard; Pflug, 1975; Wood et. Al., 1991) comparing massage, passive movement and electrical stimulation

again showed lymph flow to be greatest following massage. There is a common consent within the literature demonstrating an increase in lymphatic flow.

### ***Psychological benefits of massage:***

One of the common questions asked about massage concerns its role in promoting a feeling of well-being and even euphoria. The psychological benefits of massage for sports people include controlled arousal before competition or training, positive mood states and increased feelings of well-being (Clews, 1996; Goats, 1994; Kuprian, 1982; Mellion, 1994; Ljungfelt et al. 1994; Mcate, 1993; Birukov, 1994).

Boone et al. (1991; cited in Cafarelli and Flint, 1993) maintains that the 'recuperative benefits' accrued from massage may be more psychological than physiological. Physical relaxation can improve blood flow, reduce muscle tone and tension in connective tissue (Goats, 1994) so it can work both ways. "So often the mind and body are linked," Parker states (cited in Kukula, 1993) "I don't know if the sense of well-being promotes lactic-acid removal, or if the removal of toxins promotes a sense of well-being."

Kaada and Torstienbo (1989; cited in Cafarelli and Flint, 1993) found a 16% increase in plasma endorphin concentration after massage. These results are not borne out by earlier work which showed no change in endorphins after massage (Day et al. 1987; Puustjarvi, 1986; cited in Cafarelli and Flint).

Petrissage has shown to decrease neuromuscular excitability, but only during the duration of the massage, and the effects are confined to the muscle(s) being massaged (Starkey, 1993). No articles deny that relaxation can be brought about by massage.

### ***The nervous system – pain:***

Massage produces short-lived analgesia by activating the 'pain-gate' mechanism. Cutaneous mechano-receptors are stimulated by touch and transmit information within large nerve fibers to the spinal cord. These impulses block the passage of painful stimuli entering the same spinal segment. Other physical therapies acting upon this mechanism include thermal and electrical treatments, CTM and joint manipulation. Massage is a potent mechanical stimulus and a particularly effective trigger for the pain-gate process (Goats, 1994; Starkey, 1993; Norris, 1993).

### ***Heat and massage:***

As with other sources (ultraviolet radiation, hot water bottles, showers/baths) massage produces a heating effect. There are many important therapeutic effects from heat. A mild degree of heating is effective in relieving pain. The proposed reason for this is the sedative effect on the sensory nerves. By virtue of relieving pain, associated muscle spasm and tension are also relieved. Heat also increases the blood flow of blood by dilating the capillaries and arterioles. Heating the tissues also causes an increased muscle and ligament extensibility, enhancing easier stretching and facilitating muscle contractility (Dornan and Dunn, 1987; Cafarelli and Flint, 1993; Strauss, 1979).

### ***Injury rehabilitation and massage:***

It has been well recognized that massage is also used extensively in the area of injury rehabilitation (Starkey, 1993; Chamberlain, 1983; Anderson and Hall, 1995; Strauss, 1979; Kuprian, 1982; De Castella and Clews, 1996; Hutson, 1996; Mellion, 1994; Pellecchia, Hamel and Behnke, 1994; Goats, 1994). Inflammation is needed for tissue repair, however, too much is detrimental to the process. It is by the application of therapeutic modalities (the use of immobilization devices, exercises, anti-inflammatory medication etc.) that athletic trainers, physical therapists, and physicians attempt to control the inflammatory process.

Dr. James Cyriax is the father of 'friction massage', which is used in this injury rehabilitation setting. An understanding of the repair phase needs to be achieved in order to understand the rationale and principles behind friction massage (Chamberlain, 1983). Fibroblasts are attracted to an injured site indirectly by the presence of macrophages. A deposition of collagen is formed making a seal over the site. This deposition is unfortunately random, with little structure and order in the fibrous arrangement (causing the scar to be fragile). Stresses, in the form of gentle movements may cause these fibers to arrange themselves rapidly in a more orderly fashion (thus increasing their strength). The lack of movement during connective tissue repair can lead to scar formation and increased pain when the structure is again moved thereby stretching the scar (Cooper, 1991). Movement would appear to inhibit scar formation by several means:

stimulating proteoglycan synthesis which lubricates connective tissue and maintains distance between the fibers orienting the laying down of new collagen fibers through mechanical stress so fibers can resist tensile forces preventing intermolecular cross-linking from occurring. (Chamberlain, 1983; Starkey, 1993)

Not only does friction massage have a significant effect on collagen fiber but it also improves the extensibility of tissues (Cooper, 1991). Although this information makes a strong case for the use of friction massage which is widely used, there is a need for more clinical research supporting Cyriax's friction massage technique. The Austrian therapist, Strohal (cited in Kuprian, 1982) rejects friction entirely, considering it 'senseless and damaging'.

### ***Injury prevention:***

An experienced masseur will be able to assess the state of an athlete's muscles purely by feeling them with their hands. It has been suggested that if an athlete has a massage at least once a week they will remain injury-free during the season. A therapist can perform a thorough examination of your muscles and tissue, flushing toxins and eliminating potential injury sites. Injuries to muscles tend to show up around the surrounding area of connective tissue or fascia. Therapists can also detect muscle imbalances which could be the cause of an injury (Kukula, 1993; Dunn, 1995; Mcatee, 1993).

### ***Conclusion:***

Massage is an ancient therapy enjoying renewed interest in the sporting and medicinal world. An extensive body of research already exists on sports massage. On comparing the various articles in the field, one finds some areas of consensus along with the opposing and contradictory opinions. The different techniques seem to be unanimous, however there are inconsistencies in application protocols. Techniques will remain an art, but research will continue to clarify physiological mechanisms that underpin the various therapeutic effects. The future will depend on this research and its continued collaboration with medicine and physiotherapy.

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