Dr Graeme health products
Serious Massagers for Professional Results

Draft for comment

The sports and gymnasium guide to vibration massage

Contents

Introduction

Vibration massage is widely use in the management of many injuries and pain syndromes. However, as with conventional manual massage there are huge benefits to be had from more general usage by those playing sports or exercising. The advantage of vibration massage though is that it is much easier to do and can easily be self applied, making it easily available for practically no ongoing cost. Ready availability and lack of expense opens up far more opportunities. This guide discusses these potential oportunities and how best to achieve them.

Using vibration massage

Vibration massage is simply applied with the use of a hand held vibrating massager. Historically most available for consumer use have not been very effective(1), but more recently DrGraeme (owned by an experienced Chiropractor) has been building and supplying far more serious machines. Usage guides are supplied with the machines, and are downloadable from drgraeme.com Although there are very few risks from the use of vibration massage one should seek professional advice to ensure vibration massage is appropriate and to help get the best possible results. Injuries and pain syndromes should always be professionally assessed.

The scientifically proven effects of vibration massage

Science has shown us the effects of vibration massage, plus the protocols used to achieve them. The following section discusses these, then the next section cover's their practical application. The protocols often refer to the vibration frequency used. To put these frequencies into perspective the DrGraeme General Purpose Massager delivers massage from approximately 10-55 Hz (cycles per second).

Effect on Muscle contraction/relaxation

Various studies have shown that the application of vibration massage in the range of 20-60 Hz causes muscles to relax, while vibrations from 100-200 Hz have been shown to cause muscle contraction (2).

Effect on blood flow

Normal therapeutic applications of vibration have been shown to significantly increase blood flow (3)(4)(5). In one trial vibrations of both 30 and 50 Hz were shown to substantially increase peripheral blood flow. 50 Hz was shown to be superior, with a more rapid and longer lasting effect. Following the 30 Hz vibration blood flow slowly increased then reduced to baseline after 7 minutes. Following 50 Hz blood flow increased more rapidly and was still above baseline after 15 minutes (4).

Pain reduction

The application of stimulation at 100 HZ has been shown to reduce pain. The most common way this is achieved is by the use of a TENS machine, although the application of mechanical vibration has been shown to work at least as well, if not better (6) Simply though this is a neurological trick called the gate theory, where the vibration signals have preferential passage in the nervous system and block pain signals.

Stretch reflexes

Stretch reflexes are those elicited by receptors in the muscles to prevent elongation. As the muscle is stretched the stretch reflex causes the muscle to contract, working against stretching. It is because of these that those stretching are advised to gently hold the stretch for 30 seconds. During this time the receptors in the muscles fatigue allowing the muscle to stretch further. The application of vibration has been shown to suppress this reflex (2) (7)

Protect muscles from damage during exercise/ reduce Delayed Onset Muscle Soreness (DOMS)/ speed recovery

Damage to muscles caused during exercise is known as "exercise induced muscle damage". This results in pain known as delayed muscle soreness (DOMS) and a temporary reduction in muscle performance. It can be measured by the presence of blood chemicals that result from cell membrane damage, tissue necrosis and muscle cell damage. It has been shown that the application of 50-60 Hz vibration to muscles either prior to exercise or after exercise results in considerably less pain and the presence of considerably less of the resultant blood born chemicals (8). Various other trials have shown similar improvements in pain, function and blood chemical levels (including lactic acid) following the use of vibration massage from 30-65 Hz (9) (10) (11) (12) (13)

Increase the performance of muscles

The application of vibration has been shown to enable the nervous system to stimulate more receptors in muscles, both in number and type. The result is higher maximum contraction force and increased muscular effort (14).

Increased healing

Vibration is shown to increase the flow of blood. The benefits of increasing blood flow for healing are well understood. As an example, in those with poor circulation vibration has been shown to increase the oxygenation of tissues, and is seen as a promising therapy (15).

Further to that, trials involving cuts being made in mice (16) and rats having their brachial plexus injured then monitoring healing have shown that vibration massage produces quite amazing results. These include the following.

- Increased angiogenesis (formation of blood vessels)
- Increased formation of skin cells, granulation tissue and collagen deposits resulting in faster wound healing.
- The production of higher levels of Growth Factor and other hormones
- It can promote contraction and extension of muscle fibers, strengthen muscular tension, elasticity and tolerance, so, it can prevent and cure muscular atrophy
- can effectively promote the repair of myelin sheath and axes of injured nerves.
- It can improve peripheral nerve units and excite peripheral nerves, so as to accelerate their conduction

The benefits in practice

For the remainder of this guide we will be discussing the use of these vibration massage effects for treating muscular conditions, warming up, recovery, performance enhancement and rehabilitation. As discussed before the ability for self application or the application by training staff allows easy availability and practically unlimited massage so all these uses become an option.

Trigger points

Introduction

Many who have played sports or exercised will have had some experience with trigger points. They are those very tender lumps in muscles that masseurs and “muscle manipulators” press in and find. Their treatment is usually very painful, but afterwards pain is often gone. As well as a reduction in pain people often feel relaxed, move more freely and even stand up straighter. Science now has a far better understanding of these lumps, enabling us to better understand what they do and how to treat them. Trigger points are discussed here because most people who play sport or exercise get them, they cause pain and many other problems, and vibration massage is a useful effective treatment.

What is a trigger point

A trigger point is a small section of muscle that has gone into spasm forming the lump. Because of a neurological feedback loop it cannot relax. Because the section in spasm has shortened the whole muscle becomes tight. This tightening restricts blood flow so there develops a lack of oxygen and a build up of waste products(17).

Active vs latent

Trigger points that don’t cause pain until a masseur presses on them are known as “latent” trigger points. Although they don’t cause pain they are definitely there though. If they become worse or are aggravated they may cause pain constantly without provocation and are then known as “active” trigger points. These cause or contribute to many musculoskeletal pain syndromes. It is important to understand that both latent and active trigger points are just different phases the same thing. If a latent trigger point worsens or becomes aggravated it may start shooting pain, becoming active. An active trigger point may be treated or spontaneously settle when rested, stop shooting pain and become latent.

The effect of trigger points

Even when not outwardly causing pain trigger points cause the problems one would expect from a muscle that has a part constantly contracting, is constantly tight, and has restricted blood flow causing the tissues to be starved of oxygen and have a build up of waste products(18)

Tightness

Because the muscle is tight it restricts movement and is more prone to being injured.

Rapid fatigue and pain on exertion

In one event of the "worlds Strongest Man" competitions contestants are required to stand with their arms horizontal holding weights. Although the weights are relatively light (for them) the constant contraction with no movement to help replenish blood results in severe pain, fatigue and eventual failure. With their constant contraction, tightness and reduced blood flow muscles affected by trigger points can also fatigue quickly and become very painful (19).

Reduced performance of muscles

A muscle that is constantly contracting, tight and with a lack of oxygen and a build up of waste products will suffer from reduced performance.

Poor timing and movements, joint damage and injury

The nervous system must adapt movement and the activity of muscles in order to compensate for tightness, fatigue, poor performance and pain. This both effects performance and increases the risk of injury (20) (21) It needs to be mentioned that this neurological control happens on a subconscious level, and despite well meaning attempts has been found to not be corrected with exercises. (22)

Increased risk of injury

The alteration of movement and muscular control can result in poorly coordinated control of joint movement. This can cause increased damage to joints and risk of joint injury. A common manifestation is impingement syndromes (23).

Poor performance

The adaptation and compensation by the nervous system has been shown to alter the timing and sequence of muscle activity when producing movements. Biomechanical efficiency and accuracy are reduced. Think of a golf swing, a shot in tennis or shooting for a basket in basketball with the nervous control system not quite right(24).

Pain

Think again of the strong men with their arms out the side and their shoulder muscles screaming in agony. Trigger points can eventually worsen or be aggravated causing them to become active with them constantly producing pain. Trigger points are implicated as cause or contribution factors for a large number of musculoskeletal pain syndromes.

How common are trigger points?

Think when you have ever been examined by a masseur who discovered spots you didn't know existed. Likely there were many. A study of the lower limb muscles of 206 pain free adults found that 77% had at least one trigger point, with the average number per person being 7.5 trigger points (25). Trigger points are caused by exertion and sports people often have various aches and niggles so it is reasonable to expect the presence of even more. It's safe to say that most people who exercise or play sports will have multiple trigger points. The exception would be those professional sports people who receive regular massage and therapy. As discussed later these help keep trigger points at bay.

The treatment of trigger points (17)

How they are treated

There are a great number of ways to treat trigger points. Masseurs pressing upon them until the pain subsides is one. The use of acupuncture needles or needles with anaesthetic is another. All trigger point treatments act to do one or more of the following: break the positive neurological feedback, relax the muscle, and increase blood flow. Referring to the proven scientific effects vibration massage does all three. The treatment of trigger point using vibration massage is quite simple. One places the vibrating massager on the muscle over the trigger point allowing the vibrations to penetrate. The vibrations disrupt the neurological feedback, cause the muscle to relax, and increase blood flow. Afterwards the muscle will be far less tight, and upon examination the tender lump will be reduced or gone.

Trigger points are tough and persistent

When a trigger point is active (causing pain) treatment by a masseur, acupuncture needles or a vibration massager may give dramatic relief. Has that fixed the problem. I'm afraid not. The trigger point will have merely gone back from being active to latent. It would still be there causing all the other issues waiting for further aggravation to cause more pain. If one reads the clinical trials done on trigger points most measure success by a reduction in pain. It is easy to measure and looks good for the therapy tested. We can only find one trial that actually checked whether the trigger points were still there (26). In this trial the trigger points were treated with each week for 12 weeks, on each visit not just one but three different therapies were used, including the use of dry needles. Like all the other trials they found that pain was reduced, but when checking for trigger points 2/3 were still there, having (temporarily) reverted back from being active to latent. The bottom line is that to diminish and eliminate trigger points treatment needs to be applied consistently over a long period of time.

As previously mentioned vibration massage can be used to treat trigger points very effectively while having two huge advantages.

1. Because it can be readily available and practically unlimited it allows the consistent treatments needed over a long time.
2. When used for other purposes such as warming up or recovery the vibrations will also help treat any trigger points in the vicinity at the same time.

Warming up

Warm ups are typically done to stretch muscles and other tissues to a more effective operational length plus increase blood flow to flush the muscles with oxygen and nutrients. This serves to help prevent injuries and allow peak performance much earlier. Typically a warm up will include moderate exercise, stretching, and many elite sports also include a massage or "rub down". The use of vibration massage has several scientifically proven benefits that could be part of this routine.

- It has been shown to cause increases blood flow which lasts for over 15 minutes
- The relaxing effect has been shown to produce a lengthening in muscles equal to that produced by conventional stretching
- The use of vibration massage before exercise has been shown to reduce DOMS and speed recovery

As a guide, to achieve these effects one would apply the massager at about 50 Hz (90% of full speed for the General Purpose Massager) for 30-60 seconds on each muscle.

After exercise

Elite sports often use massage or a "rub down" after exercise to reduce residual stiffness and speed recovery. It has been scientifically shown that the use of vibration massage after exercise will result in reduced DOMS, less residual blood born chemicals such as lactic acid, and a more rapid return to full function of the muscles. The recommendation would be a similar application of 50Hz for 30-60 seconds per muscle. The main caution would be that like massage or any manual therapy, vibration massage is inappropriate for injured tissues, risking further injury and bleeding.

Increased performance

Science tells us that the application of vibration will enable the nervous system to stimulate more muscle fibres, both in type and number, resulting in a higher maximum force being generated by the muscles and increased effort. There have been a large number of trials showing this, with vibrations from 5-50 Hz seeming to require shorter applications. We're not sure how practical this would be for most sports people and gym users, but would be something an Olympic weight lifter would seriously look at.

On the other hand there would be a huge benefit from the effects of vibration massage though helping eliminating the things that prevent normal full potential. The effects of trigger points have been previously discussed. They have effects ranging from causing rapid fatigue , tightening muscles muscles and restricting movements though to causing the nervous system to alter timing and movements. If vibration massage were used to keep trigger points at bay performance would be optimal rather than restricted.

Vibration massage as part of "warming up" may help achieve peak performance earlier. Also, vibration is proven to speed recovery allowing a return to full performance sooner after exercise or sports.

Improve stretching

Relaxation affect

As previously mentioned vibration at approximately 20-60 Hz causes the relaxation of muscles. This has been shown to produce similar elongation of muscles to that achieved by conventional stretching(27) In some circumstances this may be a better option than conventional stretching. For example, in the case of an injured ankle stretching the calf muscles may damage healing ligaments, but vibration massage applied to the calf muscles would not.

Reflex inhibition

Vibration massage has been used to suppress the stretch reflex when stretching, allowing muscles to stretch further. In one trial gymnasts used vibration at 30 Hz to inhibit the stretch reflex allowing them to gain more flexibility than achieved with conventional stretching(28)

Injury prevention

A main injury prevention role for vibration massage would be the minimising and elimination trigger points. As previously discussed trigger points cause a tightening of muscles making them prone to tears and other injuries. Further, they can cause the movement of joints to become uncoordinated risking joint damage and impingement injuries. An effective way to keep trigger points at bay would help keep injuries at bay. The warming up effects of using vibration massage relaxing the muscles and generally helping prepare the soft tissues for activity would be a further role in injury prevention.

Pain syndromes

Vibration massage at 100 Hz has been shown to reduce pain. Some massagers deliver massage at this frequency. However, pain is there to stop people damaging themselves. The far better use of vibration massage is by 1) using it to help prevent injuries and 2) addressing the sources of pain. Trigger points again are a major cause of pain. The extent can be seen by doing a search on "trigger point chart". As many have found following treatment by a masseur, helping eliminate trigger points eliminates a major source of pain.

Injury rehabilitation

The rehabilitation of injuries is a complex area that needs a professional to be involved. In doing that he or she would consider the proven benefits of vibration massage such as.

- Increased blood flow and improved healing
- the elimination of trigger points
- The relaxation and lengthening of muscles

Further, professional sports people undergoing rehabilitation may receive therapy one or more times each day, but such care is usually beyond the reach of amateurs. The use of vibration massage under proper advice enables the application of therapy at the frequency professionals would have.
Again, the rehabilitation of injuries is a complex issue. Further information and resources for practitioners are provided on www.drgraeme.com

Samples, practitioner rates and sports clubs

Most DrGraeme massagers are sold by clinics and practitioners to their patients/clients. We have excellent practitioner/wholesale rates and sample massagers for degree qualified practitioners (conditions apply). Please contact us for details.
Sporting clubs and gymnasiums are welcome to enquire. However, we don't want indiscriminate usage so we ask that a practitioner or someone with significant sports/exercise training enquire on behalf of the club/gymnasium.

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