The scientifically proven effects of vibration massage - with clinical applications

Introduction
In this summary we investigate the science behind the use of vibration massage. This helps us envisage uses and to develop protocols. Most refer to relevant vibration frequencies. To put these frequencies into perspective our DrGraeme General Purpose Massagers are built to deliver strong vibration 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 muscles to contract (1).

Clinical applications
Muscle relaxation is a major goal/benefit of massage and soft tissue therapy. The research shows that this is best achieved by applying massage between 20 and 60 Hz. This can be obtained by applying our General Purpose Massager between half and full speed. Clinical experience shows that about ¼ speed works very well and is very comfortable for patients. There are massagers designed to run faster, as this has a pain reducing effect (discussed later). However this causes contraction rather than relaxation. These faster speeds can be used in to stimulate muscles for specialist techniques used for certain neuromuscular conditions.

Effect on blood flow
In the extreme, excess vibration can have an adverse effect on blood flow. This is an issue with occupational hazards such as using a chainsaw. Research has shown that gripping a handle vibrating at 30-480 Hz for one hour will reduce blood flow to the hands and fingers. Further, such vibration at 120Hz will slow nerve conduction (2). However, normal therapeutic applications of vibration have been shown to significantly increase blood flow (3) (4) (5). In one trial vibrations both 30 and 50 Hz were shown to substantially increase peripheral blood flow, with 50 Hz giving the superior, with a more rapid and longer lasting effect. 30 Hz vibration slowly increased blood flow, which lasted for about 7 minutes. Following 50 Hz blood flow increased more rapidly and was still above baseline after 15 minutes (4).
**Clinical applications**
Like the relaxation of muscles, an increase in blood flow to the tissues is a major therapeutic goal of massage and soft tissue therapy. The application of vibration at 50 Hz was shown to be the best way to achieve this. This can be applied by using our General Purpose Massagers at about 90% of full power.

**Pain reduction**
As discussed throughout this guide vibration massage is useful to help address several causes of pain. However, the application of stimulation at 100 Hz has been shown to neurologically block 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 (8)

**Clinical applications**
Our DrGraeme massagers have been built to help address many of the causes of pain rather than to block pain signals. However, some other massagers though run at 100 HZ for this purpose. As an example, a trial showed that repeated applications of 100 Hz massage to the distal quadriceps muscles produced a considerable reduction of symptoms in those with osteoarthritis of the knees (9)

**Stretch reflexes**
Stretch reflexes are those elicited by receptors in the muscles to prevent excessive elongation. It is a protective mechanism that causes the muscle to contract when being overstretched. The application of vibration has been shown to suppress this reflex (1) (10)

**Clinical application**
There are two significant uses for this effect. First, in a trial gymnasts used the application of 30 Hz vibration inhibiting the stretch reflex to achieve superior results to stretching without vibration (15). Secondly, as discussed in a later section the suppression of this reflex helps allow the spasmed sections of muscles that form trigger points to relax. This is a key component of trigger point therapy.

**Reduce post exercise soreness and 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. The application of 30-65 Hz vibration to muscles either prior to exercise or after exercise results in considerably less pain, faster recovery, and the presence of considerably less of the resultant blood born chemicals (16) (17) (18) (19) (20) (21) (22).

**Clinical applications**
The research clearly shows that those exercising will have less pain and recover faster if vibration massage is applied to muscles either before or after exercise. This is a simple convenient, economical therapy that should be recommended to all those who play sport or exercise, and have no contra-indications. The General Purpose Massager delivers 50-60 HZ at maximum or near maximum speed. A typical protocol may be applications of 60 seconds to the belly of each muscle as part of a warm up routine, then after exercise and each day during recovery.
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. (23)

Clinical applications
This should be of interest to anyone who wishes to achieve greater performance, such as those who play sport or work out in a gym. A research summary (23) found 21 published trials covering this area. The protocols and vibration frequencies used varied widely. However, in general they found that the lower frequencies (5-50 Hz) used short duration applications compared with those for higher frequencies. They also found that better results were achieved by applying the vibration directly to the muscles rather than via indirect methods such as having the weight being lifted vibrate.

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 (24). Trials involving animals though have been able to investigate the effects of vibration much further. In one such trial uniform cuts were made in mice (25) while in the other the brachial plexus of rats were injured (26). Healing with and without the application of vibration was monitored in both. The results were quite amazing. They 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 fibres, 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 brachial plexus
- It can improve peripheral nerve units and excite peripheral nerves, so as to accelerate their conduction

Clinical applications
If one uses vibration massage to help rehabilitate a musculo-skeletal injury it would be certain that the increased blood flow would have a positive effect on healing. There would probably be an increase the production of growth hormones, an increase in repair tissue and blood vessel formation, plus other benefits. This would be an incredible benefit. However, they cannot be promised.

References
4. Maloney-Hinds C, Petrofsky JS, Zimmerman G. The effect of 30 Hz vs. 50 Hz passive vibration and
12. Atha J, Ph D, Wheatley DW, Sc B. JOINT MOBILITY CHANGES DUE TO LOW FREQUENCY VIBRATION AND STRETCHING EXERCISE *( b ) Astride standing : head pressing to alternate knees ( d ) Rear lunge , with toe rest : calf and leg stretching. October: 1974;26–35.
Further information
For further information we have a large number of usage guides and research summaries on our website www.drgraeme.com If you are a practitioner interested in trying vibration massage please contact us directly for further information, practitioner rate massagers and possibly a sample massager.

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