Summary of research on the effect of vibration massage on muscle length and joint range of motion, with practical applications

Introduction
In this article we will briefly review some research findings in relation to the affects of vibration massage on allowing muscles to relax and lengthen, thus allowing joint range of motion (ROM) to increase. Following that we will discuss how we make a practical use of this. It is provided as general information only. While we hope you put it to great use, such use should be consistent with your training and your patient’s needs. Any feedback will be most appreciated.

Research on the effect of vibration massage on joint range of motion (ROM)
In all the trials below vibration massage was applied to muscles. Joint ranges of motion were measured, with increase being due to a lengthening of muscles allowing the joint to move further.

**Trial One (1)**
Knee extension was measured with the hip flexed to 90 degrees. Multiple applications of 50 Hz (cycles per second) massage were applied to the hamstring muscles over an eight week period. Compared with the control group the massage group had an average increase of 13-14 degrees.

**Trial Two (2)**
Hip flexion was measured by attempting to touch one’s toes. For the massage group a 44 Hz massage was applied each day to the hamstrings for three days. A stretching group used conventional stretches each day, while a third group acted as a control. Both the stretching and massage groups showed a similar significant improvement in hip joint ROM

**Trial Three (3)**
This trial used the toe touching measurement and hamstring massage. Vibration massage was used with unspecified protocol on the hamstrings and erector spinae muscles. The massage group showed a 5cm improvement as compared to the controls.

**Trial Four (4)**
In this trial a straight leg raise (SLR) was measured. A proprietary device called “Deep Oscillation” was used. This is a device that has a pad that is applied to the skin. The makers claim that it’s therapeutic affect is from mechanical vibrations that penetrate. From what is understood the pad creates an electrostatic attraction to the skin that switches on and off. It
works like having a vacuum cleaner on your skin switching on and off very fast creating a vibration. In other words, it’s an impressive looking, patentable and very expensive way to create a simple mechanical vibration. Anyway, the Deep Oscillation group had an increase in SLR over the controls.

**Practical use of this information**
Like stretching exercises, localised vibration massage has been shown to be an effective method of producing lengthening of muscles, and therefore increasing joint ROM. In some situations stretching exercises would be the best choice, while in others the use of vibration massage would be the best. This section will cover two situations where the use of vibration massage is by far the best choice, if not the only choice.
1. Situations involving damage or injury
2. Where it is difficult or impossible to isolate a stretch to a specific muscle or joint.

**Additional benefits**
As discussed elsewhere in our practitioner manual the use of vibration massage will have other beneficial affects. For example, if used as "stretching" during a warm up it will increase localised blood flow, help reduce post exercise blood flow and speed recovery. If used post exercise it will decrease soreness and speed recovery. As discussed in our section on assisting healing, if used as part of rehabilitation it will speed healing by increasing blood flow plus possibly a host of other affects.

**Injured ankle example**
The first situation where vibration massage by far the best choice is where stretching can cause damage to an injury. Let us use an ankle sprain as an example. The typical treatment is to first immobilise the joint while the damage to the ligaments and other localised structures heal. While the joint is immobilised the calf muscles will shorten, but stretching at this stage would involve ankle joint movement which would damage the healing ligaments. On the other hand, as long as there were no contraindications localised vibration massage could be used on the calf muscles while the ligaments were healing. Once the ligaments heal far less rehabilitation would be needed.

**Other examples**
There are many other examples of where this principle could apply. It is very common for a person with an injured lower back to have muscles deep in around their pelvis and hips that are shortened and need stretching. However, stretches for these muscles also tend to put stress through the lower back, causing the risk of further injury. Vibration massage could be used on these muscles with the person lying in a neutral position. This should not place stress on the injured lower back.

**Spine example**
The second situation where the use of vibration massage is an excellent choice are functional problems where it is difficult or impossible to isolate a specific joint or muscle. Let’s use the spine as an example. In your spine you have many joints, each doing basically the same thing. This spreads the work so each individual joint does not have to work too much. When a spine bends each joint should move a little bit, adding up to a complete movement. The issue here is that it is impossible to isolate movement or a stretch to one specific joint. It is a common situation for one joint to be injured then subsequently stiffen while healing. As this happens the adjacent joints often become hypermobile to compensate. In this situation how does one isolate movement to the stiffened joint in order to stretch that joint's intrinsic muscles? A spinal stretch will only isolate movement to a region of the spine, not to an individual joint. Within that region most movement would occur in the hypermobile joints. On the other hand vibration massage can be applied directly to the intrinsic muscles of the stiffened spinal joint.
An illustration of changes due to spinal injury
The following diagrams show how spinal function can change over time due to injury. These situations require very specific elongation "stretching" of muscles and mobilisation of joints. Specific elongation can be achieved by a direct application of vibration massage. The specific mobilisation of the joints requires a specific adjustment/mobilisation. This is something that requires a high degree of specialised training.

Normal spine

**Balanced (Left)**
This shows a normal spine in a balanced neutral position. There are joints between the vertebrae. The muscles (red) balance and move the spine.

**Normal bending (right)**
To bend normally the muscles on one side pull tight while the muscles on the other side relax to allow movement. Each vertebrae moves about the same amount.

An injured spine

**Initial injury (right)**
This diagram shows an injury to the lower joint. While this is healing the body tends to splint or restrict movement at the injured joint while, letting the adjoining joints move extra to compensate. This diagram shows the spine bending to the left. The injured lower joint has not moved while the joint above is moving extra.

**Long term functional change (right)**
If healing takes a considerable time, or where there is repeated injury (eg. an occupational task) the injured joint may stiffen while the compensating joint may start moving too much. In this case the muscles associated with the stiff joint will shorten while the ones associated with the joint moving too much will lengthen. This is a very common issue with serious long term consequences including increased wear and potential injury for the compensating joint, and of course pain.
References