Using vibration massage to help healing

There is very good evidence accumulating that the use of therapeutic vibration will enhance and accelerate healing while having no adverse affects. In this guide we will discuss the evidence and practical applications.

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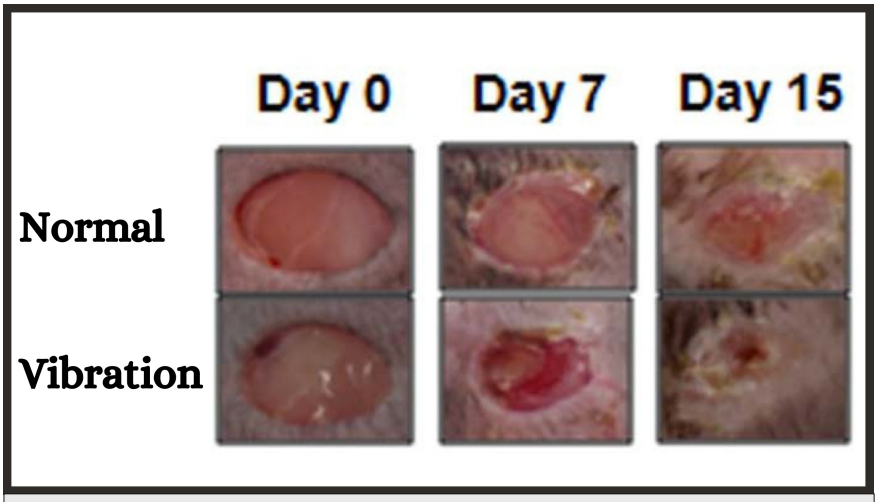

Example from trial showing wound healing using 45Hz vibration

The evidence

There are several types of evidence supporting the use of vibration to improve and accelerate healing.

1. Proven effects
2. Indirect evidence
3. Human healing trials
4. Animal trials

The proven effects

Therapeutic vibrations have been proven to increase circulation, which will increase oxygenation and the nutrient supply to healing tissues. For more info: The scientifically proven effects of vibration massage- with clinical applications

Indirect evidence

Therapeutic vibrations have been shown to decrease post exercise soreness and speed the recovery of full function. Soreness and reduced function are the result of strenuous exercise causing microscopic damage to the muscle fibres. It is assumed that the reduced soreness and improved function result from that damage healing. For more info: The best massage for sports recovery

Human healing trials

Several clinical trials have found that therapeutic vibration speeds and improves healing in patients suffering from diabetes (1–3). The researchers believe that this is due to the vibrations improving circulation. A review of the studies (3) concluded:

> *"This scoping review summarized the evidence regarding the effectiveness of vibration therapy for hard-to-heal wounds. Low-frequency and low-intensity local vibration therapy is useful for promoting wound healing based on evidence from human studies. The current optimal settings could be summarized as follows: local vibration at a low frequency within 47Hz and low-intensity (1.78 m/s2) for less than 30 min, three times a day, and five weeks."*

Animal studies

Studies performed on animals (rats and mice) show improvements in healing **far more profound than just due to increased circulation**. These are detailed in the appendix below, but include:

- increased growth and size of muscle fibres
- a reduction of fibrosis (scar tissue)
- increased vascularisation
- Increased nerve regeneration
- increased production of natural growth hormone

Why animal experiments

Researchers are unable to test whether similar things occur in humans because they cannot deliberately injure large numbers of people then later dissect them to examine the results. As long as it is safe though it is perfectly reasonable to assume that the results apply to humans. As an example, vibration is often used to speed and improve fracture healing. This was adopted following research which was done by breaking bones in sheep.

Practical advice

The researchers investigating diabetic patients strongly recommend the use of therapeutic vibrations to help healing, stating that it is very effective and has no adverse effects. Therapeutic vibrations have also proved to be very effective for reducing post exercise soreness and speeding the recovery of function. However, the potential uses and benefits may extend to any situation where healing is required.

Safety

While the diabetes researchers state that there are no adverse effects, one would need to use some sensible clinical judgment in other circumstances such as applying the vibration away from injured tissues until they were structurally sound enough.

Protocols

What the researchers used

- The diabetes researchers recommend the application of 47Hz for less than 30 minutes, thrice daily for five weeks.
- The animal researchers applied 45Hz for 10-30 minutes daily.
- In our guide on the therapeutic effects of vibration we recommend that the most desirable effects for musculoskeletal therapy occur at around 50 Hz.

Practice suggestions

The research suggests that if you use therapeutic vibration in the 40-50 Hz range as therapy for any musculoskeletal condition you will help speed and improve healing. However, the diabetes and animal research showed that good results were obtained by using repeated applications over time. This could be used in any case where healing is involved, whether it is strained muscle through to something more complex. With appropriate advice patients can easily self apply 40-50 Hz therapeutic vibration using one of our massagers.

Massage guns are not suitable

As discussed in our guide The guide to evidence based percussion massage (massage gun) usage, massage guns (percussion massagers) are designed to drive their heads in like jackhammers rather than send in therapeutic vibrations. Because of this:

- they send in far less vibrations
- they cannot safely or comfortably be run at the required 40-50Hz
- the physical penetration of their heads are likely to cause damage rather than help healing.

Appendix: the animal experiments

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Healing bone fractures

There have been a large number of trials investigating the effect of vibration on the healing of bone fractures. **All trials showed that the application of vibrations sped up healing remarkably (1–9)**. Therapeutic applications have generally been in the range of 35-45Hz, with applications of 20-30 minutes per day. Researchers have viewed healing on xrays, measured various blood chemical levels and noted the number of osteoblasts (bone producing cells).

Wound healing

We found two trials that measured the effect of vibrations on wound healing. The results are illustrated in the following pictures.

Trial (13): This photo and graph shows the effect of applying 45 Hz vibration for 10 minutes per day, as compared with using an alternative method of stimulating growth: electrostimulation.

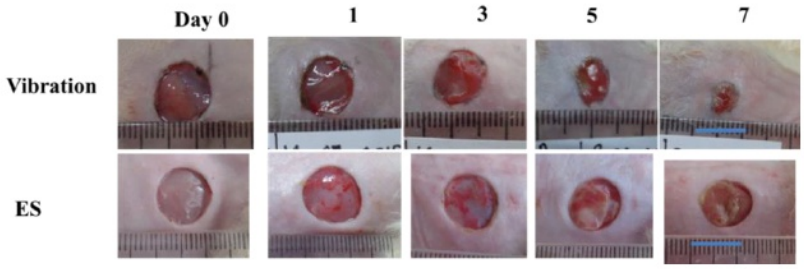


Figure 4. Macroscopical findings of the wounds treated with vibration (upper picture) and Electrical stimulation (lower picture) (bar = 1 cm)

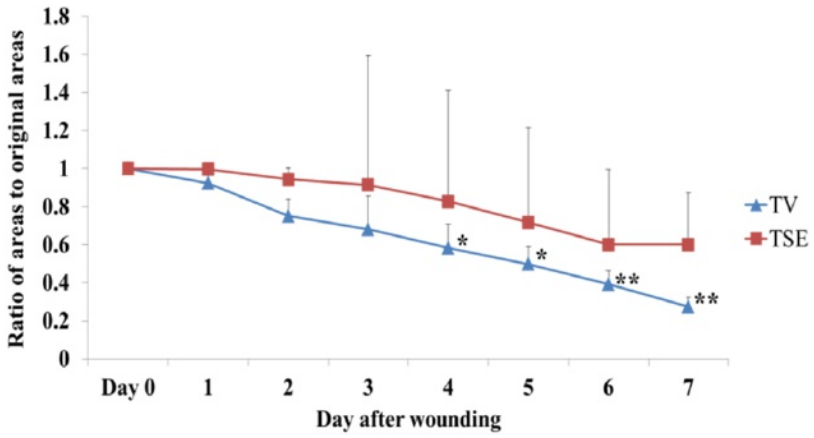
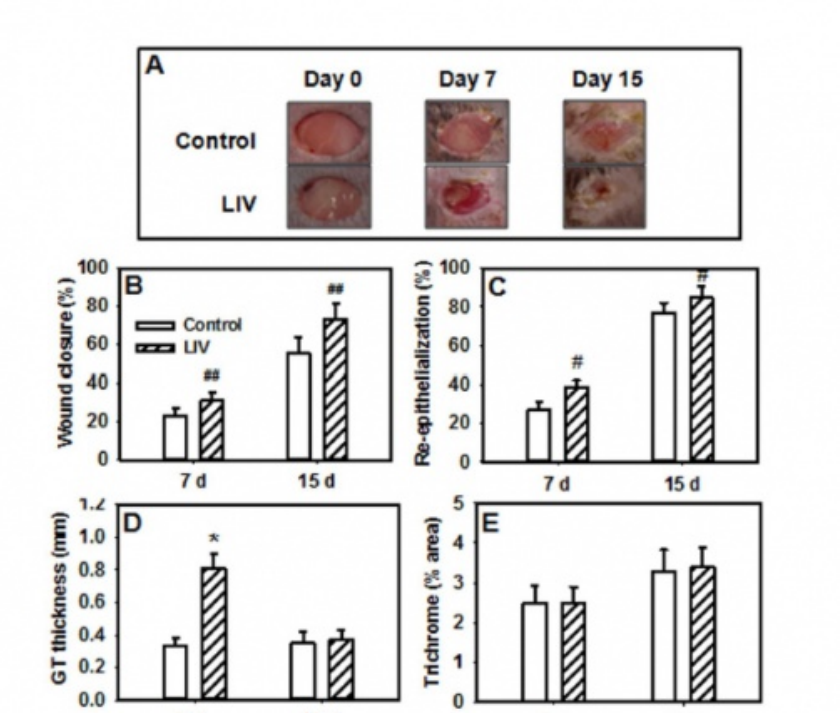


Figure 5. The comparison of the wound size between the wounds treated with vibration and electrical stimulation (* P< 0.05, **P< 0.01)

The healing of a wound when vibration is used vs healing with an alternate therapy electrical stimulation

Trial (14): This trial used 45 Hz for 30 minutes per day. LIV stands for low intensity vibration, while the controls were allowed to heal naturally.



Wound healing: the effects of vibration - separate trial

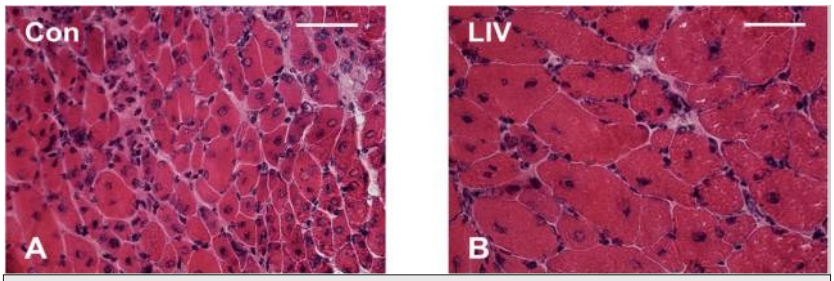
Muscle injury healing

A study into the effect of vibration on the healing of muscles used applications of 45 Hz for 30 minutes a day. **As shown in the following pictures this resulted in a remarkable**:

- increase in the size of muscle fibres, and
- a reduction in the amount of fibrosis (15)

Increased muscle fibre growth

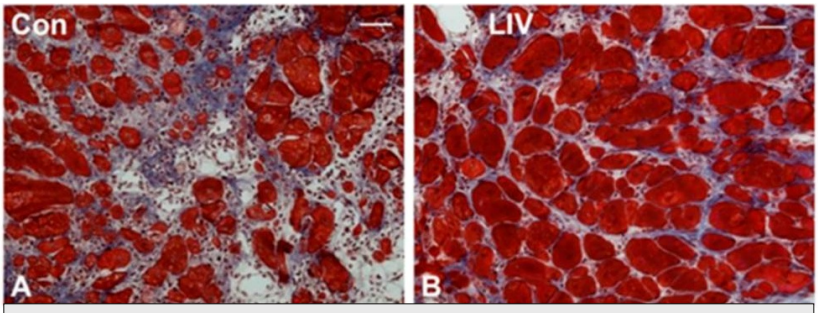
This photo shows the effect on healing muscle of 45 Hz vibration for 30 minutes per day. It shows muscle fibres in cross section. Those receiving vibration have clearly grown much larger (15).



Increased growth of muscle fibres due to vibration

Reduction in fibrosis (scar tissue)

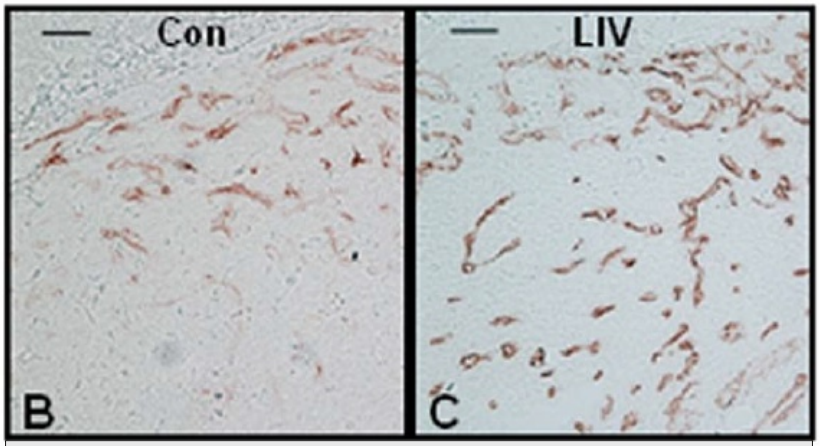
From the same trial. In these photos the lighter staining represents fibrous scar like tissue, while the red is the muscle fibres. **This clearly shows that the application of 45 Hz vibration for 30 minutes per day resulted in healing and muscle growth with far less scar tissue**. Scar tissue is detremental because it reduces flexibility and has no functional strength.



Increased growth of muscle fibres due to vibration

Formation of blood vessels

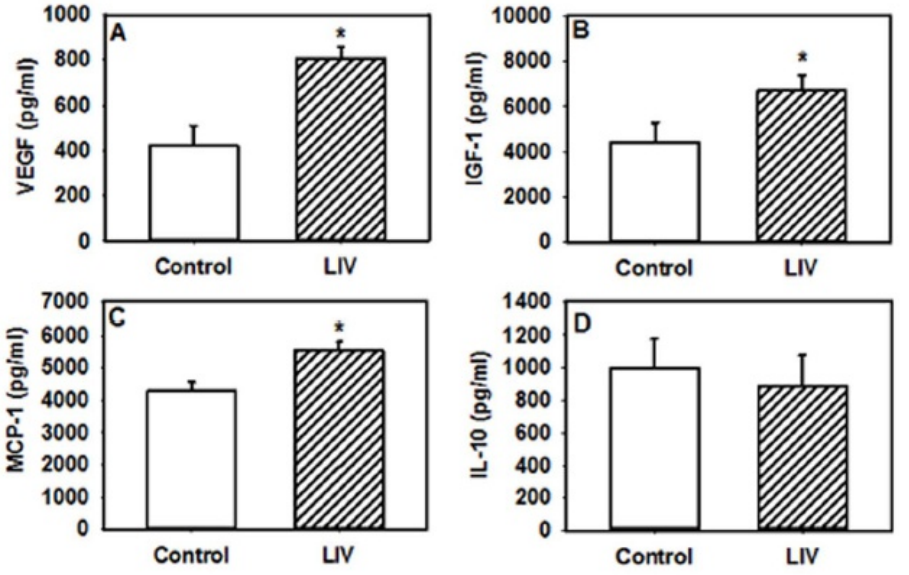
The formation of blood vessels is very important as it allows nutrients to be delivered to the healing tissues. **In these pictures the darker lines are the blood vessels. It shows that vibration (LIV) cause the growth of a lot more blood vessels (14).**



The formation of blood vessels stimulated by vibration

Level of growth hormones

Growth hormones are your body's natural version of the steroids body builders and athletes illegally use. Of course these are legal and enhance your body rather than cause long term harm. **As shown in these graphs vibration of 45 Hz for 30 minutes a day caused a remarkable increase in several of these (14)**. Where the graph shows a lower level it's actually a good thing for that chemical.



Vibrations cause an increase on levels of growth hormones ("D" is better when lower)

Nervous tissue

Scientist investigating the effect of vibration on the healing of nervous tissue by deliberately injuring the brachial plexus on a large number of mice (13) . What the found was truly remarkable. We've reproduced their summary of findings in an appendix, but in summary the vibration was found to:

- accelerate the formation of new skin and tissues, speeding the closure of wounds
- accelerate the formation of new blood vessels
- increase blood flow and increase the permeability of capillaries allowing more blood to the tissues
- increase the production of Growth Factor and various other growth related hormones.
- promotes the repair and regeneration of nerves
- increase the activity of various other chemicals needed for growth and repair

Appendix one: results in the scientist's own words

The following is a direct quote from the trial testing the effects of vibration on the healing of injured nerves. There are a few technical terms, but overall it's pretty easy to understand (13).

Effect of Mechanical Massage Treatment on Muscles of Limbs

Mechanical vibration massage treatment has obvious effect on muscular atrophy induced by nerve root injury. It can dilate capillary, increase volume of blood flow, so as to greatly improve blood supply and nutrition in local tissue; It can make the wall of micrangium rhythmically flatten and restore, accelerating flow of blood; And it can promote contraction and extension of muscle fibers, strengthen muscular tension, elasticity and tolerance, so, it can prevent and cure muscular atrophy.

Effect of Mechanical Massage on Secretion of NGF (Nerve Growth Factor- a growth hormone)

Benign stimulation of mechanical vibration massage can activate the response of nerve immune and neuroendocrine systems, and transmit the signals to the submandibular gland through complicated ways, promoting secretion and storage of NGF in the submandibular gland. Finally, NGF is transported to brachial plexus root injury area through digestive, circulative and nerve systems.

Effect of Mechanical Massage on Repair of Injured Nerves

Mechanical vibration massage can effectively promote the repair of myelin sheath and axes of injured brachial plexus in the rat. It can effectively improve blood circulation of the injured myelin sheath, promote proliferation of SC and survival of the cell body of injured neurons, so as to form a necessary regenerative micro-environment early for repair of nerve, and it induces stress responses of immune and neuroendocrine systems in the rat,promotes secretion of NGF in this gland, and it can improve peripheral nerve units and excite peripheral nerves, so as to accelerate their conduction reflection.

Effect of Mechanical Massage on Na+, K+-ATPase Activities

Na+, K+-ATPase activity on the surface of muscular cell membrane is an important limited factor for excitability and contractile strength of muscular cells. After skeletal muscles lose nervous innervation, generation of ATP is hindered, so Na+, K+-ATPase activity decreases. Under the mechanical massage stimulation, the muscular cells cultured in vitro show increases in stress-related gene expression and protein synthesis, leading to adaptability reconstruction of structures and contractile characters of the muscular cells, which are closely related with activation of Na+, K+-ATPase, and influences the distribution and functional activity of Na+, K+- ATPase on the surface of muscular cell membrane. In brief, mechanical vibration massage can promote the regeneration and recovery of the brachial plexus, and effectively slow down the decrease of Na+, K+-ATPase activities induced by the nerve injury, preventing muscular atrophy, and it promotes the generation of submandibular gland NGF, providing a favorable environment for regeneration of nerve"

References

1. Mahran HG, Helal OF EFA. Effect of Mechanical Vibration Therapy on Healing of Foot Ulcer in Diabetic Polyneuropathy Patients. j Am Sci. 2013;9(7):76–87.
2. Syabariyah S, Nurachmah E, Widjojo BD, Prasetyo S, Sanada H, Irianto, et al. The Effect of Vibration on the Acceleration of Wound Healing of Diabetic Neuropathic Foot Ulcer: A Prospective Experimental Study on Human Patients. Healthc. 2023;11(2).
3. Haba D, Itabashi M, Tamai N, Tobe H, Sanada H, Nakagami G. Effectiveness of Vibration Therapy for Hard-to-Heal Wounds in Clinical Study: A Scoping Review. Chronic Wound Care Manag Res. 2024;Volume 11:1–12.
4. Zhao B, Li R, Cheng S, Dong X, Tan L, Chen Y, et al. Intermittent low-magnitude high-frequency vibration promotes osteogenic protein expression and inhibits osteoclastogenic cytokine secretion in osteoblasts. Biomed Res. 2018;
5. Tan L, Li YH, Zhao B, Li Y, Zhu D. Intermittent low-magnitude high-frequency vibration enhances biological and radiological parameters during fracture healing in sheep. Int J Clin Exp Pathol. 2017;
6. Mu D, Yu J, Lin J, Li C, Hao B, Gu F, et al. Intermittent vibrations accelerate fracture healing in sheep. Acta Cir Bras. 2019;
7. Wang J, Leung KS, Chow SKH, Cheung WH. The effect of whole body vibration on fracture healing – a systematic review. European Cells and Materials. 2017.
8. Bilgin HM, Çelik F, Gem M, Akpolat V, Yıldız İ, Ekinci A, et al. Effects of local vibration and pulsed electromagnetic field on bone fracture: A comparative study. Bioelectromagnetics. 2017;
9. Li Y, Liu G, Yu J, Li C, Tan L, Hao B, et al. Effects of continuous or intermittent low-magnitude high-frequency vibration on fracture healing in sheep. Int Orthop. 2018;
10. Shi HF, Cheung WH, Qin L, Leung AHC, Leung KS. Low-magnitude high-frequency vibration treatment augments fracture healing in ovariectomy-induced osteoporotic bone. Bone. 2010;
11. Ho-Kiu Chow. Low-Magnitude High-Frequency Vibration (LMHFV) Enhances Bone Remodeling in Osteoporotic Rat Femoral Fracture Healing J Orthop Res. 2011;23:746–52.
12. Leung KS, Shi HF, Cheung WH, Qin L, Ng WK, Tarn KF, et al. Low-magnitude high-frequency vibration accelerates callus formation, mineralization, and fracture healing in rats. J Orthop Res. 2009;
13. Sari Y, Saryono S, Sutrisna E, Hartono H. A Comparative Study of the Effects of Vibration and Electrical Stimulation Therapies on the Acceleration of Wound Healing in Diabetic Ulcers. J Ners. 2017;
14. Weinheimer-Haus EM, Judex S, Ennis WJ, Koh TJ. Low-intensity vibration improves angiogenesis and wound healing in diabetic mice. PLoS One. 2014;9(3):3–10.
15. Corbiere TF, Weinheimer-Haus EM, Judex S, Koh TJ. Low-intensity vibration improves muscle healing in a mouse model of laceration injury. J Funct Morphol Kinesiol. 2018;3(1):1–14.
16. MEI R, XU Y, LI Q. Experimental Study on Mechanical Vibration Massage for Treatment of Brachial Plexus Injury in Rats. J Tradit Chinese Med. 2010;