

THE EFFECTS OF WHOLE-BODY VIBRATION

White paper by Oy Neurosonic Finland Ltd.

This white paper has been produced to describe a whole body, horizontal vibration and its physiology- and subjective-based effects by Oy Neurosonic Finland Ltd. Parts of this paper may have been published elsewhere and are referred to in this document.

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SUMMARY

- Typically, whole body vibration (WBV) devices are designed to provide stimulation in the vertical direction when the customer is standing on the device. In this way, oscillation can be used, for example, to enhance muscle power output or mobility.
- Neurosonic technology is designed so that the customer is in a lying, horizontal position on the device and the vibration is directed to soft tissues in this position. In this way, a powerful effect is produced in the peripheral nervous system through the sensory and sympathetic nervous system.
- Vibration greatly relieves anxiety, stress, muscle tension, pain and promotes sleep quality.
- The effects of stimulation in the autonomic nervous system can be observed, for example, as a decrease in resting heart rate, improvement in heart rate variation (HRV) and changes in the electrical conductivity of the skin (GSR).
- Changes are also observed in peripheral blood circulation and fluid circulation as changes in skin heat and in many individuals as swelling and weight loss.
- The technology can be easily installed on various furniture such as chairs, mattresses or beds.
- Vibration is a non-invasive form of stimulation and safe to use.

Introduction

Neurosonic has developed a new generation of therapeutic device that utilizes low-frequency vibration with a wide-ranging effect. Neurosonic device affects health in a holistic way, at the same time increasing the metabolism, blood circulation, fluid circulation and pacifying the autonomic nervous system activity. When added to these effects by stimulation of an extremely relaxing effect, stress-related symptoms are relieved quickly and recovery from stress accelerates.

Description of Neurosonic-method

Neurosonic is a muscle- and tissue stimulation form of therapy. Each muscle group and tissue have its own frequency domain, where they oscillate, for example during exercise. These bands range from 10 - 100 Hz, depending on the tissue, the size, location, the liquid content and the temperature of it. The same frequencies operating in the body can be used to strengthen tissue function. Similar vibration derived from the outside of the body causes tissue resonance in the tissues. A good example of counter resonance is two guitars in the same room and in the same tune. If one of the guitar's A-string is played, the A-string of the second guitar starts to vibrate when its characteristic frequency is strengthened. We can use this same phenomenon in the human body as well.

We have placed 4-6 vibrators inside various furniture and mattresses. The sine-wave vibration is produced by the processors and amplifiers of the Neurosonic CPU and is transmitted to the vibrators via cabling. Vibrators cause the entire mattress or furniture surface to vibrate and stimulation penetrates through entire body of the person resting on the device simultaneously causing metabolic changes.

Various devices cover various materials, from foam to artificial leather or upholstery fabrics. Anti-bacterial, official standard materials are used in client equipment. Neurosonic devices are wirelessly controlled by mobile devices via Bluetooth. The program library contains 8 different treatment programs for relaxation (4), activation (2) and recovery (2). The duration of the programs is between 10 to 41 minutes.

When the vibration starts, the effect is immediate; tissue metabolism is stimulated, neurotransmitter activity is activated in muscle-nervous system and tactile sense, in fact, the entire nervous system is under effect of vibration. Tissues are not only activated, but activation is also directed to cells, especially cell membranes. Their permeability is improved because of the pressure (the physical movement of the tissue) and the frequency of vibration (related to the size of the vibrating molecules/cells) against the surface of the cell membrane, opening ion channels.

Neurosonic application and its vibration promote normalization of blood supply, improvement of qualitative structure of blood (oxygen saturation, optimum removal of carbonic acid from fabrics, high-grade immune function of blood etc.). Produced vibrations have positive effect on lymphocapillar network system, work of ureter and bowels, improvement of blood supply of the nervous endings and positive influences a functional condition of nervous system. As a result of action Neurosonic vibration is increasing intensity of proceeding biophysical processes, mechanisms activation of restitution, regenerations, immunity, an intensive excretion of slag's and activation of hormone development.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4560014/>

<https://www.ncbi.nlm.nih.gov/pubmed/21042329>

<https://www.ncbi.nlm.nih.gov/pubmed/21078065>

<https://www.endocrine.org/news-room/current-press-releases/whole-body-vibration-may-be-as-effective-as-regular-exercise>

<https://medicalxpress.com/news/2019-08-body-vibration-microbiome-inflammation-diabetes.html>

Typically, whole body vibration devices are producing and transmitting low frequency stimulation when client is on standing, vertical position. This means that the effect of vibration is directed to skeletal muscle groups and can be used for example muscle strength training. In Neurosonic, whole body vibration is directed and transmitted in a horizontal position when muscle groups and muscle afferents are already relaxed. With this type of approach, effect is totally different than vertically given vibration. In particular, it affects to bloodstream in tissues and internal organs and one of the essential effects is the extremely refreshing and restorative effect of stimulation. This can be used, for example, to increase the alertness during the working day.

Neurosonic was originally developed to help people get rid of bodily tensions in psychotherapy. Studies and user experience show that our devices can be used to relieve the most varied symptoms and especially it relieves the symptoms that are caused by acute or chronic stress. The method has patent pending for the relief of stress related sleep disorders in EU and USA.

<https://helda.helsinki.fi/handle/10138/159913>

The main areas of the use of the devices are:

- Promoting falling to sleep and sleep quality
- Promoting recovery from exhaustion
- Pain relief
- Relief of muscle tensions and headache
- Promoting better bowel function
- Blood circulation promotion
- Promoting better state of alertness

Mechanical vibration

Mechanical vibration is a movement in which a particular disorder progresses in the medium. The mechanical oscillation is based on the fact that, with the advancing pulse, the individual particles of the medium cause its adjacent particles to vibrate in a similar manner. In mechanical vibration, particles move energy but do not always progress. For this reason, mechanical vibration cannot occur without a suitable medium. Examples of this model are the behavior of water molecules on the surface and water of the water and the function of the coil spring. Periodically repeated disturbance causes a wave motion to propagate in the medium.

The wave motion generated by the mechanical continuous oscillation in the solid may be either transverse or longitudinal movement. Solid interparticle bonding allows for rapid propagation of the wave motion if necessary. There can be no other than mechanical vibration within liquids and gases.

Lehto, H., Luoma, T., Havukainen, R. & Leskinen, J. 2005. Fysiikka – Lämpö ja aallot. 1.-2. painos. Helsinki: Tammi.

Possibilities of using mechanical vibration in healthcare

The idea of using vibration in healthcare is relatively new. The first vibration training exercise was known to have been tried by Russian scientists in the 1990s. Later, the effects of vibration have been studied slightly more extensively in both the acute and longer term. (Cardinale & Bosco 2003, 3.) Vibration has been used in health care as a tool and as part of rehabilitation, for example, in developing physical fitness and stimulating bone development. According to the study, the whole-body oscillation has improved, for example, the maximum force of knee extension. (Fagnani et al. 2006, 956-957)

More and more regular, short-term and low-amplitude vibration training has begun to be studied. Studies have suggested that vibration training is considered as an effective way to improve physical performance and increase bone density. Properly implemented vibration training can be considered as a safe exercise form for people of all ages. In many studies, vibration training has been shown to have healing effects, especially on the performance of older women, as it can increase muscle strength and improve dynamic balance. (Russo, Laretan, Bandinelli et al. 2003; Roelants, Delecluse & Verschueren 2004; Verschueren, Roelants, Delecluse, Swinnen, Vanderschueren & Boonen 2004; Rubin, Recker, Cullen, Ryaby, McCabe & McLeod 2004; Runge, Rehfeld & Resnicek 2000; Kiiski, Koivusalo & Female 2007, 1738.)

Effects of mechanical vibration on the human body and body functions

During oscillation, energy from the vibrating source is transferred to the entire human body or to a particular body part, resulting in reactive forces. The human body is a spring-mass system whose tendons and muscles act as a spring, storing and releasing mechanical energy, and wherein the rigidity and mass of these body parts determine the natural frequency. As a result, the human body is able to collect mechanical energy when the oscillation frequency of the vibrating device corresponds to the resonance frequency of the body. (Ritweger 2010, Cochrane 2011, 19)

It has been found that direct transmission of the vibration to the desired tissue may contribute to physical performance. Also, the whole-body vibration can have a significant temporary effect on the muscle strength of the lower limbs, among other things. (Fagnani, Giombini, Di Cesare, Pigozzi & Di Salvo 2006, 957).

According to Cronin et al. (2006, 31), several studies have suggested that vibration can increase mobility in both the acute and longer term. According to various studies, vibration has increased the mobility of some young adults by up to 30% (Cochrane & Stannard, 2005; Issur, VB, Liebermann, DG, & Tenenbaum, G. 1994; Sands, McNeal, Stone, Russell, & Yemni, 2006; Van den Tillaar, 2006, Cronin 2006, 30).

The main mechanisms of acute oscillation are reported in various sources including:

- Improves co-operation between influenza and counterpart muscles. This reduces the braking force of the counterpart muscles and thus increases the result of, for example, forearm bending. (Cochrane & Stannard 2005, 863)
- Improves the pain threshold, allowing a person to tolerate stronger stretching in the muscle (Cronin et al., 2006, 31).
- Improves surface blood circulation, allowing for better stretching (Lohman, Petrofsky, Maloney-Hinds, Betts-Schwab & Thorpe 2007, 73-74).
- Suspected of irritating the central nervous system that controls the relationship between muscle tension and relaxation (Cardinale & Lim 2003, 623).
- Prevents stretch reflex by stimulating Golgi tendon organs (Golgi tendon organ presented in section 8 HERMOS) (Cronin et al. 2006, 31; McKinley & O'Loughlin 2011, 511-512).

Pain and whole body vibration

There is already scientific evidence of the whole body's vibration function in pain relief. Vibration is a non-invasive and safe way to relieve a variety of pains. Scientific evidence can already be found, for example, in pains associated with lower back pain, neuropathy, fibromyalgia, burns and metabolic syndrome.

<https://journals.sagepub.com/doi/10.1177/1559325818802139>

<https://www.sciencedirect.com/science/article/pii/S136085921300017X>

<https://www.ncbi.nlm.nih.gov/pubmed/18990045>

Customer feedback and preliminary studies show that Neurosonic has a rapid and effective effect on very different types of pain, but especially on those with long-term stress. Here are the results of a pilot study.

Treatment of neck and low back pain and sleep disorders with Neurosonic-method

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Methods

Subjects

A controlled trial with 6 working age chronic NP or LBP patients, who were selected among volunteers (Table1), and were treated 4 times with the Neurosonic-chair within one month.

Questionnaires

Patients were examined by the same PT using neck or low back examination formula to evaluate physical functioning. The following subcategories were used: functions, inspection, mobility, pain provocation, muscle tightness, stability and neurological/neurodynamic tests.

The visual analogue scale (VAS) was used to assess perceived pain in the low back and neck pain. The VAS used was a 10-cm horizontal line ranging on the left by “no pain” and on the right by “unbearable pain”.

Oswestry and Neck pain index questionnaires were used to measure disability. There are 10 items in each from 0 to 10. Minimum disability is 0% and maximal disability 100%.

Sleep disorder index questionnaire was used to evaluate sleep disorders/difficulties. Sleep disorder index has six paragraphs, of which five points are added together. The maximum points are 28 and minimum 0. 0 - 7 points indicate no significant insomnia, 8 – 14 points mild insomnia, 15 – 21 points moderate insomnia and 22 – 28 points severe insomnia (Morin et al, 2011).

Neurosonic method

Neurosonic is based on low frequency whole body vibration. Mechanical oscillations are led to body in relaxing position from a chair, bed or mattress. Average treatment time is 30 minutes.

Table 1. Subjects

Demographic features;

No. of subjects (females/males)	6 (2/4)
Age, females, mean (SD)	47 (8)

Results

Neck or low back pain disability index decreased 5.7 (SD: 10.9) points and VAS 3 (SD: 3.2) points (Table 2). Sleep disorder index decreased 6.5 (SD: 7.7) (table 3). There was no change in physical functioning.

Table 2. VAS and low back and neck pain index before and after treatment sessions.

Subject	age	date	disability index	VAS	date	disability index	VAS	change in disability	change in VAS
male	64	15.4.-13	36	VAS 5/10	13.5.-13	10	VAS 0	26	5
male	65	15.4.-13	28	VAS 4/10	13.5.-13	26	VAS 2/10	2	2
male	36	15.4.-13	30	VAS 5/10	13.5.-13	32	VAS 7/10	-2	-2
female	31	15.4.-13	12	VAS 8/10	13.5.-13	14	VAS 7/10	-2	1
male	61	15.4.-13	16	VAS 8/10	13.5.-13	6	VAS 3/10	10	5
female	27	15.4.-13	14	VAS 8/10	13.5.-13	14	VAS 1/10	0	7
								mean	5,7
								SD	10,9
									3,2

Sleep disorder index

The interview was conducted before the treatments' start and immediately after them. Both interviews were received four subjects from six. The average points before treatments were 13,25 in the whole group. Minimum points were 8 and maximum points 19, so severe insomnia did not occur in the study group.

In the sixth section of the interview it was studied how a bad night's sleep increases fatigue, operational difficulties, emotional problems and physical symptoms. Scores can range from 0 to 16 in this section. The average points in this section were 9,25 before the treatments. After the treatments the average was 2,75. This shows that treatment has a significant effect to those symptoms in this group.

Table 3. Sleep disorder index before the first and after the last session.

subject	age	date	sleep index	date	sleep index	changes in sleep index
female	31	22.4.13	17	10.5.13	0	17
male	65	22.4.13	8	10.5.13	9	-1
female	27	22.4.13	9	8.5.13	5	4
male	36	22.4.13	19	8.5.13	13	6
						mean 6,5 (SD: 7.7)

Discussion

Sleep disorders/disturbances are quite common symptoms that have their effect on the productivity and well-being of everyday life. Neck and low back pain are combined with sleeping problems, insomnia etc. Still the cause and effect causality are not clear. A large-scale questionnaire offers a good reference for evaluating the prevalence of the self-reported sleep disorders/disturbances associated with physical symptoms. There are many ways to tackle that problem: physiotherapy, medication, physical activity and nowadays also the Neurosonic method. This study shows the effectiveness of the Neurosonic method on the main problem; sleep disorders. Low back or neck functioning (decreased mobility, muscle tightness e.g.) did not change, but there were neither targeting exercises nor treatment on it).

The weakness of our study lies in its small sample size, although they represented very well the population who visit their physician in occupational health. We neither had a longer follow-up. Sleep disorder index was not available from 2 of 6 participants. There was no control group.

Conclusions

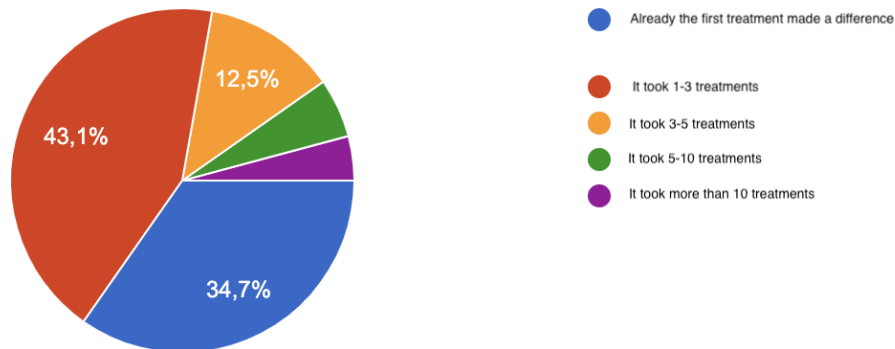
When using this passive approach; the Neurosonic method, we got good results at least for short period. This indicates the new randomized study with larger population.

CUSTOMER SURVEY ON NEUROSONIC'S EFFECT ON PAIN RELIEF AND SLEEP

We conduct customer feedback surveys to provide subjective experience of the various effects of equipment. The information is used to further develop the method and improve the customer experience. Here are the results of our pain survey. There are currently 72 respondents.

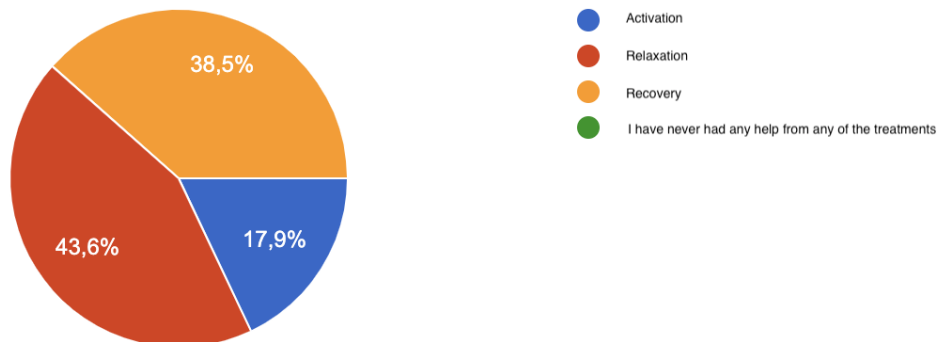
How quickly Neurosonic affected on your pain?

72 answers



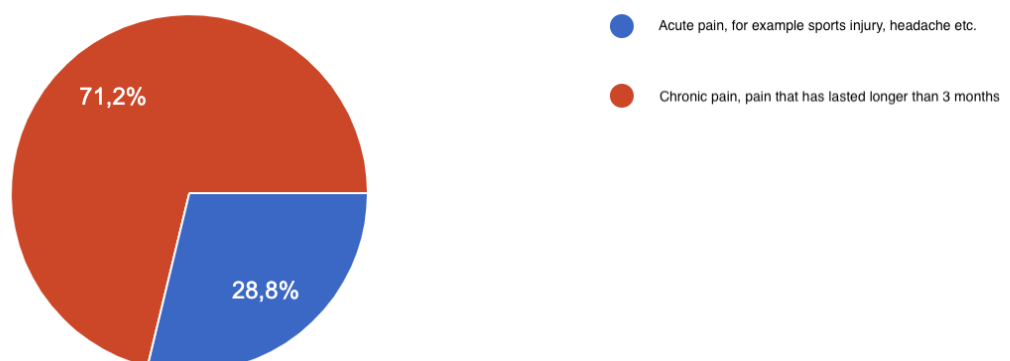
Which program-type has helped you most?

71 answers



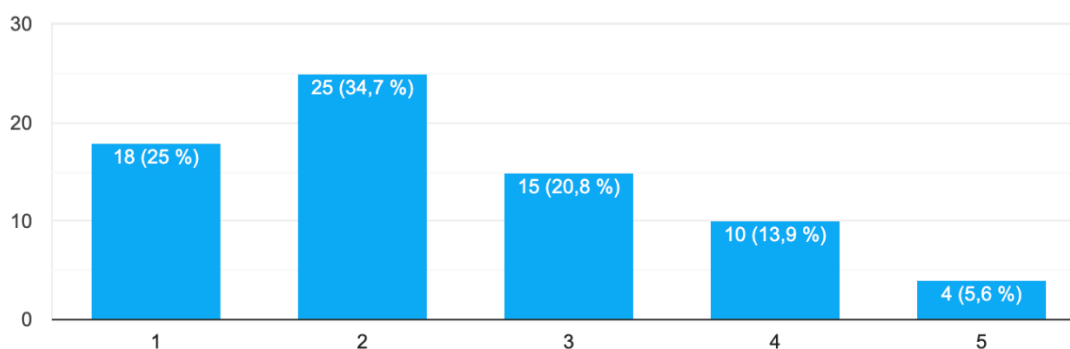
Which kind of pain are you suffering from?

72 answers



The quality of your sleep before the treatments

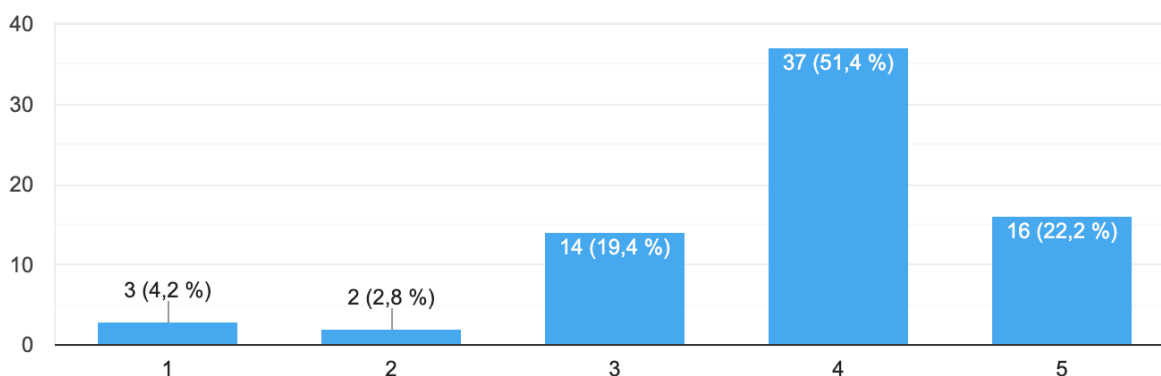
72 answers



The above graphics indicate the quality of sleep responses before treatments. The options were between 1 - 5, where 1 means very bad and 5 restorative, good quality sleep.

The quality of your sleep during the treatments

72 answers



The above graphics illustrate the quality of sleep when treatments have begun. It would seem that the pain experience and the improvement of sleep quality go hand in hand. Over 80% of respondents felt that they had received relief of pain for up to five treatments and that the experience of improving sleep quality is very similar.

Neurosonic, stress and sleep disorder – A pilot study -

ABSTRACT

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Thesis : Study Neurosonic method, the effect in stress and sleep disorder

Supervisor (s): Jukka Jauhiainen

Term of completion and year : Spring 2013 Pages: 68 + 11 appendices

This study investigates the effect of Neurosonic to stress and sleep disorder. Neurosonic method is applied to low frequency vibrations to desired parts of the body or the whole body simultaneously. The client was Neurosonic-developer, psychotherapist Marco Kärkkäinen from the Company Ltd Neurosonic Finland Ltd. The aim was to investigate with the subjective VAS segment - evaluation the effect on the stress level and generally to relaxation level. In addition, the bio signal measurements were performed. These results were used for interpretation of the results of subjective knowledge and support for the autonomous nervous function measurements.

Neurosonic study first carried out the pilot for the basis of further research, which was attended by 10 people. The selection criterion was the subjectively perceived stress and at least 3 -month duration of a sleep disorder. The study was based Neurosonic-chair care series, evaluation of subjective feelings and the evaluation of bio signal, which were measured by EEG, EMG and ECG. The results were EEG and EMG theta wave RMS values and ECG heart rate variation values of variables.

The results showed that the level of stress lessened, the overall relaxation level increased and sleep disorders reduced. The study subjects reported they were sleeping better and for

extended periods and demonstrated that awakenings in the middle of the night reduced. The method affected the functioning of the autonomic nervous system by increasing the activity of the parasympathetic nervous system. This was detectable in heart rate variation in the results, which indicate persons' to be more relaxed after the investigation period than before it. The results indicate that further research is needed to study effects of Neurosonic-method in stress and sleep disorders.

Keywords:

Neurosonic, stress, heart rate variability, insomnia, bio signal

Acute physiological and subjective effects gained by Neurosonic treatment – A pilot study -



5 December 2013 Degree Programme in Sports and Leisure Management

Abstract

Authors Veera Ikonen	Group or year of entry LOT 2009 .
The title of thesis Acute physiological and subjective effects gained by Neurosonic treatment	Number of report pages and attachment pages 35+6
Supervisor: Timo Vuorimaa . <p>Neurosonic relaxation chair produces low-frequency vibration to different parts of the human body, and it is used to relax and settle both the muscles and the mind and also to speed up the recovery after physical exercise. The purpose of this thesis was to study the acute impacts of a single Neurosonic low-frequency treatment on physiological and subjective variables that describe the recovery after sports exercise.</p> <p>The subjects of the study were 10 voluntary athletes. The study measured acute impacts of Neurosonic treatment after a sports exercise on the subject's resting heart rate, heart rate variability, lactate level in the blood and the variables that describe subjective recovery. In addition, the impact of the treatment on the subject's sleep in the following night was investigated.</p> <p>The study showed that the Neurosonic treatment had an impact on the length and quality of the subjects' sleep in the following night. The quality of the subjects' sleep was significantly better after an ON treatment than after an OFF treatment, $p < 0.05$. However, after the ON treatment the subjects slept remarkably less than after the OFF treatment (7.1 ± 7.4 vs. 7.7 ± 4.7 h, $p < 0.05$). The athletes considered that they felt much more refreshed during the ON treatment (3.75 ± 0.87) than during the OFF treatment (2.95 ± 1.01), $p < 0.05$. After the ON treatment the subjects felt that they were remarkably more recovered (4.4 ± 0.66) than after the OFF treatment (3.3 ± 1.4), $p < 0.05$. The subjects considered also that they were significantly more relaxed after the ON treatment (4.75 ± 0.68) than after the OFF treatment (3.75 ± 1.12), $p < 0.05$.</p>	
Key words Recovery, sleep, Neurosonic, physiological variables	

Effects of Neurosonic low-frequency treatment on primary insomnia patients suffering from poor sleep quality

Helsinki 10.11.2013

The final report

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Summary:

Objective of the study was to examine how the low-frequency based Neurosonic chair (Whole - Body Vibration; WBV-therapies) effects on primary insomnia sufferers. Research hypotheses were:

1 Neurosonic-chair improves the quality of sleep on those who's suffering from insomnia

2 Neurosonic-chair use to relieve insomnia associated with anxiety

The study involved 16 people (12 male, 4 female) suffering from primary insomnia. They were randomly assigned the intervention and control group (8 + 8). Entry criteria were insomnia difficulty measuring ISI- query scores of 15 or above. Both groups were given five Neurosonic- treatments. The control group had a three-week period at the beginning, when they didn't receive treatment. The research methods were actigraphy (movement activity registration), SCL -90, WHO-5, PSQI-, ISI- and EQ -5D-forms, as well as wide Vitalmed- sleep questionnaire.

In both groups, the ISI-values decreased after Neurosonic-treatments statistically significantly. Also, anxiety decreased after treatment. When the intervention and control group's results were combined, statistically significant results were found in somatization ($n = 16$, $z = 2.88$ $P = 0.004$), anxiety ($N = 16$, $z = 2.24$, $p = 0.025$), and obsessive symptoms ($N = 16$, $z = 1.77$, $p = 0.078$) ratio.

The results give an indication of positive effects of Neurosonic-treatment in the treatment of anxiety and primary insomnia. No significant side effects were observed.

Neurosonic-therapy is useful, for example in situations where pharmacological therapy doesn't give an adequate response. It should be noted that the number of subjects is small and the follow- up period short, so further studies are needed.

Keywords:

Primary Insomnia, Vibration, Insomnia, Relaxation, Anxiety

Effects of vibration on the autonomic nervous system

The effect of mechanical vibration on the positive changes in autonomic nervous system activity has been studied very little. In fact, most of the studies have focused on the negative effects of very low frequency, less than 10 Hz, mechanical industrial vibration, for example on the peripheral nervous system.

It is known that mechanical vibration of less than 20 Hz causes negative effects in the body, such as autonomic neuropathy. It is also known that frequencies above 20 Hz have beneficial effects, respectively. These can be seen in terms of mobility, blood circulation, overall metabolism and power output to name a few.

Through long period of evolution, we have found frequency bands and spectrum combinations that have very beneficial effects on the autonomic nervous system. These combinations of frequency bands are used in Neurosonic treatment programs for various purposes. There are three main areas of use: activation, relaxation and recovery, and each of these areas treatment program has its own specific frequency variation and vibration intensity and these combinations produce the desired effects; For example, a person who is exhausted in his work and suffers from difficulty falling asleep and night time awakening is in favor of using a relaxing treatment area. Another example may be a top athlete who will not sleep after performance. She benefits from a regenerative treatment area, where both, the autonomic nervous system calms down, and the muscles recover more quickly.

The body's basic metabolic function is related to survival and the autonomic nervous system controls and regulates the functioning of this system. The autonomic nervous system is divided into two parts, sympathetic and parasympathetic.

Sympathetic nervous system

The purpose of sympathetic action is to maintain vital functions and control their interaction. Under the influence of any external or internal stress, the activity of the sympathetic nervous system accelerates and responds to the threat that arises. The sympathetic nervous system is divided into descending and ascending parts. Descending sympathetic pathways are associated with cerebral stress and send commands to internal organs, heart, blood circulation, breathing and muscles and they respond to the situation in the right way, sometimes just as they should, but in prolonged stress, due to the effect of human psyche, they maintain stress in the body. This is essentially related to a life-threatening stress situation, because the body does not recognize what stress is all about. As an example of such a

situation one can use a person who, due to work-related pressure and expectations, is drifting into a situation that does not experience the possibility of escape and begins to suffer from negative thoughts and sleep disorder. All his thoughts are related to work and poor sleeping, and his inner experience activates the descending sympathetic network, whereby stress gets worse and the symptoms worsen.

The rising sympathetic nervous system controls the body's function in the peripheral nervous system and transmits messages to the brain, which again respond by transmitting instructions to perform various functions and maintain balance. Pain and its communication to the brain is one of the most important functions of this network. There are many factors involved in exceeding the threshold for pain, but the long-term negative stress sensitizes this system. Stress causes blood circulation to the large, muscular muscles, and other muscles begin to suffer from a weakened blood circulation. Digestion is also slowed down because there is no need for this function in stress situations.

In the area of the peripheral nervous system, debris begins to accumulate, and with a bad oxygen situation, the peripheral nervous system is in a continuous alarm state. Weak circulation in the tissues and intestines leads to a spiral where the body does not get enough oxygen and nutrients, and thus performance is reduced. As a result of prolonged stress, the sympathetic pathways from the brain to the body and from the body to the brain are constantly overactive and it is very difficult to get rid of the situation. Therefore, special attention should be paid to activating the parasympathetic nervous system.

Parasympathetic nervous system

The parasympathetic nervous system is active at rest. It is a counterbalance, a brake, on a sympathetic gas pedal and thus essential for our well-being and health. Balance of digestive function, bladder emptying, heart rate and heart rate variation, for example, are all dependent on the state of the parasympathetic nervous system. Recovery from exertion accelerates only by increasing parasympathetic activity.

The Vagus nerve is the most important part of the parasympathetic nervous system. It extends from the brainstem to all important organs of the body, such as the heart, lungs and intestine, thus having a wide impact on our health. It helps to reduce stress, anxiety and inflammation by activating the parasympathetic nervous system. Vagus-nerve is the main switch of recovery system and there is scientific evidence that stimulation of the vagus nerve affects the relief of many symptoms. Vagus nerve stimulation (VNS) refers to any technique that stimulates the vagus nerve, including manual or electrical stimulation.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4017164/>

Description of the human nervous system

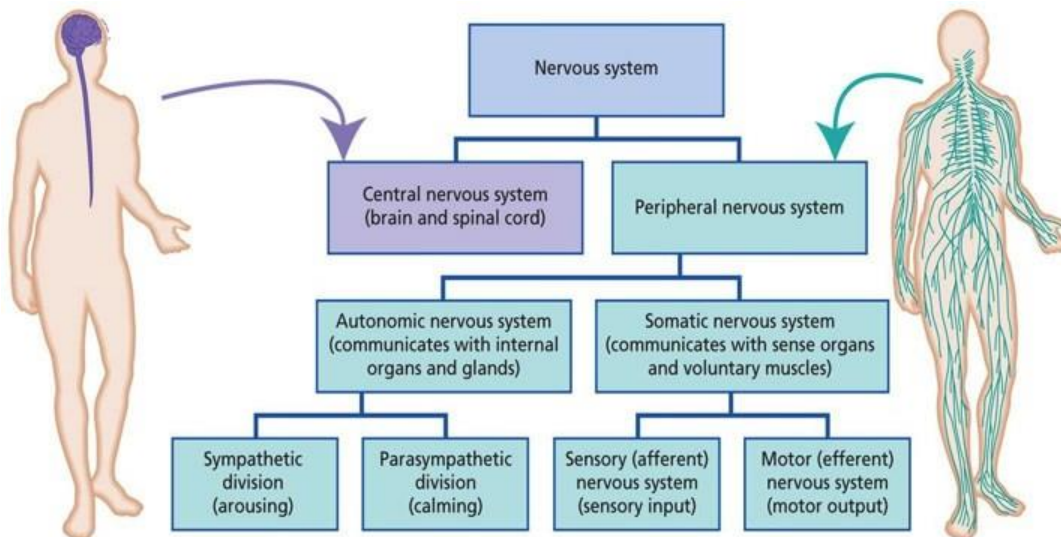


Figure 1. Main principle of the nervous system. Horizontal WBV stimulates somatic (skin, fascia, joints, skeletal muscles, special senses) and visceral sensory nervous system.

Picture: <http://psychologyhacked.com/biopsychology/nervous-system/>

Functional Organization of the PNS

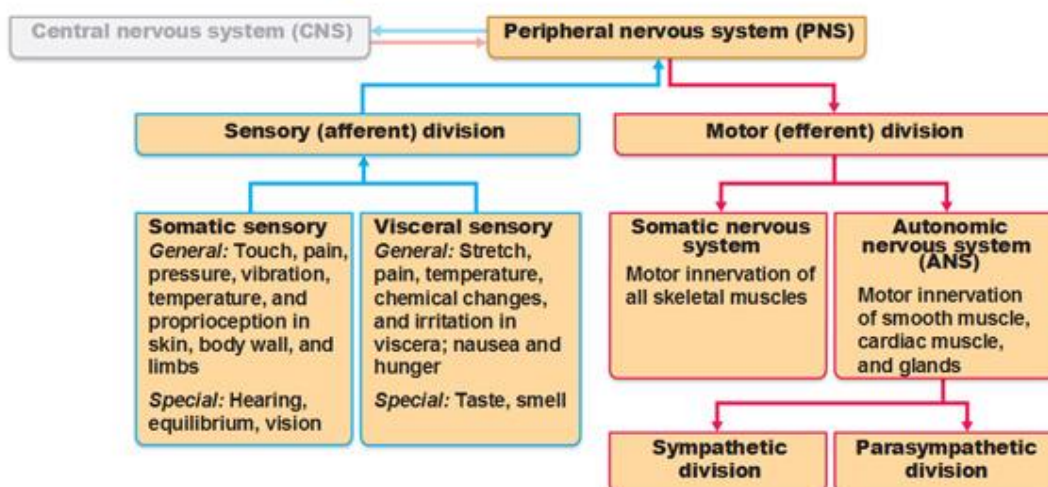


Figure 2. Sensory division is widely stimulated by WBV and this affects to motoric division. Stimulation affects, for example, a reduction in smooth muscle tension and pain, an improvement in bowel function, a decrease in resting pulse, and an improvement in heart rate variation.

Picture: <https://antranik.org/visceral-sensory-neurons-and-referred-pain/>

NEUROSONIC®