

## Review of the WHO Environmental Noise Pollution Guidelines for Europe

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Ladies and Gentlemen,

I understand that you are currently in the process of developing the WHO Environmental Noise Guidelines for the European Region as a regional update to the WHO Community Noise Guidelines. As a physical therapist I am extremely worried about environmental noise produced by large wind turbines and the way it affects human health.

Please, take into consideration that there are countries like Finland, where there is no defined safety distances in existence between wind turbines and residential houses. This has led into a situation, where the wind turbines are built as cheaply as possible next to the finished infrastructure. Currently in Finland wind turbines of 3 -5 MW are built on the mainland, but there are plans for even larger wind turbines (up to 8 MW with total height of 250 m). There are several areas in Finland, where the most sensitive persons (like people with severe heart diseases, migraine, or even previously healthy people) have started to have symptoms within weeks of wind turbines starting to operate. In addition, the symptoms have rapidly changed from ear sensation (e.g. ear blockage, feeling of pressure) to heart symptoms (e.g. arrhythmia).

From the perspective of rehabilitation, the affects of sound pressure waves can be considered as follows:

Methods that utilize the direct physiological effects of low frequency sonic vibration, are called Vibro-acoustic therapies. One of its forms, Physioacoustic therapy, has been developed in Finland in co-operation with physiology, psychology, medicine and electro-acoustic experts. In that method, low-frequency sonic vibration is transmitted to the body by the speakers. It is known, that very low frequencies pass through solid and liquid, and therefore Physioacoustic vibration reach inner parts of the body.

Several functions of the human body occur at very low frequencies. The sonic vibration given from outside can cause a counter-resonance of the body. In that phenomenon, tissues of the body vibrate at the same frequency as the sound wave. In Physioacoustic therapy, there is used a single 27-113 Hz sine tone. Sound is a pure sine tone, which oscillates at a certain frequency sound. The different frequencies can affect different muscles or body parts.

The membranes are also responsive to the acoustic vibration. Cell membrane resonance alter membrane permeability properties and open ion channels that allow passage of enzymes involved in the metabolism

of the cells is facilitated. Since the vibration at the same time affects the tissues, blood circulation, respiration, metabolism and neural functions, there is a treatment effect on the psychological functions, in particular, mood and alertness.

When implemented in the right way, Physioacoustic therapy can promote tissue regeneration, restoration or recovery from an error condition. Sound wave frequency, intensity and direction of rotation are controlled carefully. Continuous, steady irritation can cause muscle strain and numbness. Or, if the treatment has started with too strong pulsation, it may cause dizziness and nausea. Different programs can have adverse effects, such as alertness activation vs. Tranquility. It is very important that the treatment is given by a person with training health or therapist, as well as adequate familiarization with the method.

Physioacoustic therapy is contraindicated or not recommended, if a person has e.g. an acute inflammatory condition or intermediate bulge, pacemakers, severe heart failure, bleeding (not menstrual), angina pectoris, or during pregnancy 1st trimester. Diabetes patients must take into account the possible emergence of insulin feelings.

Wind turbine noise pollution is not a pure sine-like sound, but sound alarm plurality of frequencies containing a mess. It varies in both frequency and in intensity.

In addition to audible noise, large wind turbines produce infrasound (below 20 Hz), which limited human sense of hearing is not able to recognize, but which the brain react. The rapid variation of sound pressure waves caused by the wind turbines may cause constant stress to the body, and the consequences of that are well known.

In studies, animals have been observed and they have been found to suffer of chronic stress if they live close to wind turbines. In years of monitoring, wild badgers for instance, did not get used to the noise produced by wind turbines and had raised cortisol levels. Such results demonstrate that for the purposes of this particular problem, it is crucial that the examination of animal studies should be part of the panel's remit.

When all the above is taken into account, I ask you, Ladies and Gentleman, the following questions:

- Would any medical practitioner recommend either Physioacoustic therapy, or the exposure of levels of noise for 24/7 for large numbers of global populations from turbines often reaching 200 meters or more?
- Now more and more people are exposed to continuous sound pressure waves produced by wind turbines. It should be remembered that low frequency sounds can travel long distances from its source, and even if the dosage is small, exposure is around the clock. Therefore:
  - (a) What are the consequences? (b) Is a safe dosage to the human body defined?
- What are the effects of the sound pressure waves for the most vulnerable groups, such as fetuses and developing children? How have they been protected, and who is responsible for their protection?
- Vibroacoustic therapies are used to hypersensitive groups, such as people with autism. But on the other hand, uncontrolled noise on the background can cause them stress anxiety, and possibly even physical pain. How their, or other groups with sensory processing disorder, special needs are taken into account

with regard to protection against harmful effects of wind turbines? Considering, that e. g. infrasound perceived as a mixture of auditory and tactile sensation.

- Understanding the health risks caused by wind turbines requires familiarization with the technology used in wind energy. Is it realistic to expect that the local authorities or local doctors understand this relatively new factor sufficiently to protect human health? How are the medical doctors trained to notice any of the symptoms wind turbines may cause? **N.B. The classification of diseases ICD-10 detects infra-sound nuisances with code T75.2.**

It is noteworthy, that noise of wind turbines differs from all the rest in the soundscape: nothing else produced by humans or nature sounds similar to it. So, it is natural that people react in varying degrees of severity to this abnormal noise in their environment. Wind turbines cause a new environmental factor in our environment and its adverse impacts must be identified and prevented in an adequate way. The symptoms residents are increasingly reporting from all over the world tell us that this obligation, which is clearly in the domain of governmental responsibility, has so far been completely unsuccessful.

When assessing the effectiveness of the Vibroacoustic therapies, are the client's feelings and subjective experience playing the key role. When we understand that human can hear and **feel** the low frequency noise, **the symptoms residents feel close to wind turbines should not be underestimated. Importantly, since recent studies of the human body have only just begun to improve understanding of human sensations e.g. through the viscoelastic fascia, subjective experience must clearly be taken account to enhance credibility.**

Finally, I should like to draw your attention to an applicable and important ethical obligation which is: **First, do no harm.** Equally applicable in this area of concern is the Nuremberg Code in terms of experimentation on human's without their consent, ***before safety*** has been established. Members of the panel might be aware that the only other instance of a product where this is allowed to happen is the Military, where the consequences of exposure to weaponry are very clear.

Yours sincerely,

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Sources:

Ahonen H. (1993) "Musiikki sanaton kieli. Musiikkiterapian perusteet." Helsinki: Finn Lectura.

Agnew et al. (2016) "Wind turbines cause chronic stress in badgers (*Meles Meles*)" Journal of Wildlife Diseases, 52(3), 2016, pp. 000–000 \_ Wildlife Disease Association. June 2016

[www.jwildlifedis.org/doi/abs/10.7589/2015-09-231](http://www.jwildlifedis.org/doi/abs/10.7589/2015-09-231)

Alves-Pereira et al. (2009) "Understanding the biological responses elicited by low frequency noise exposure: contributions to vibroacoustic disease research."

[http://www.fasciacongress.org/2009/abstract\\_pdf/079R%20Understanding--AlvesPereira%5B1%5D.pdf](http://www.fasciacongress.org/2009/abstract_pdf/079R%20Understanding--AlvesPereira%5B1%5D.pdf)

Alves-Pereira & Branco (2007) "Vibroacoustic disease: Biological effects of infrasound and low-frequency noise explained by mechanotransduction cellular signalling." *Progress in Biophysics and Molecular Biology*, Volume 93, Issues 1–3, January–April 2007, Pages 256-279

[www.sciencedirect.com/science/article/pii/S0079610706000927?np=y](http://www.sciencedirect.com/science/article/pii/S0079610706000927?np=y)

Bartel et al. (2012) "Good vibrations: using sound to treat disease" University of Toronto.

<https://www.utoronto.ca/news/good-vibrations-using-sound-treat-disease>

Boyd-Brewer C. & McCaffrey R.(2004), "Vibroacoustic sound therapy improves pain management and more. *Holist Nurs Pract*"

Boyd-Brewer "Vibroacoustic Therapy: Sound Vibrations in Medicine"

<http://vibroacoustic.org/FrequencyInfo/Vibroacoustic%20Therapy.pdf>

Gupfinger et al. (2009) "INTERACTIVE INFRASONIC ENVIRONMENT: A New Type of Sound Installation for Controlling Infrasound"

[http://www.gupfinger.net/wp-content/uploads/IIE\\_reinhard\\_gupfinger09.doc.pdf](http://www.gupfinger.net/wp-content/uploads/IIE_reinhard_gupfinger09.doc.pdf)

Hammer (2012) "Can the Body Use Fascia as a Method of Communication?"

<http://www.dynamicchiropractic.com/mpacms/dc/article.php?id=55966>

Langevin H . Connective tissue: A body-wide signaling network? *Medical Hypotheses* 2006; 66, 1074-1077.

<http://www.ncbi.nlm.nih.gov/pubmed/16483726>

Lehikoinen P. (1998) "The Physioacoustic Method. Acoustic Vibration in Medicine" *Musiikkikasvatus*.

Lukasiak A. et al. (2013) "Evaluation of the effectiveness of vibroacoustic therapy treatment of patients with so-called "heel spur". A preliminary report" <http://www.ncbi.nlm.nih.gov/pubmed/23510823>

Lundqvist et al. (2009) "Effects of vibroacoustic music on challenging behaviors in individuals with autism and developmental disabilities"

<http://vibroacoustic.org/FrequencyInfo/Research%20Articles/Austism-Vibroacoustics-Report-4-25-11.pdf>

Naghdi L. et al (2015) "The effect of low-frequency sound stimulation on patients with fibromyalgia: A clinical study" <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4325896/>

Rinne S. (2009) "Fysioakustisen hoidon vaikutukset ikääntyneiden liikkumiskykyyn"

Sandström M. et al. (2004), "Vibraatio ja sen käyttömahdollisuudet", Sjukgymnasten 2004:1:28-31

van der Wal J. Proprioception, mechanoreception and the anatomy of fascia. Teoksessa Schleip R, Findley T, Dcaitow L, Huijing P. The tensional network of the human body. Churchill Livingstone, Elsevier, China 2012. ss 81-82.

Wigram T. et al. (2002), "A comprehensive guide to music therapy"

<http://www.nyanssi.net/vibro-ja-fysioakustinen-hoito-lisatietoa/>