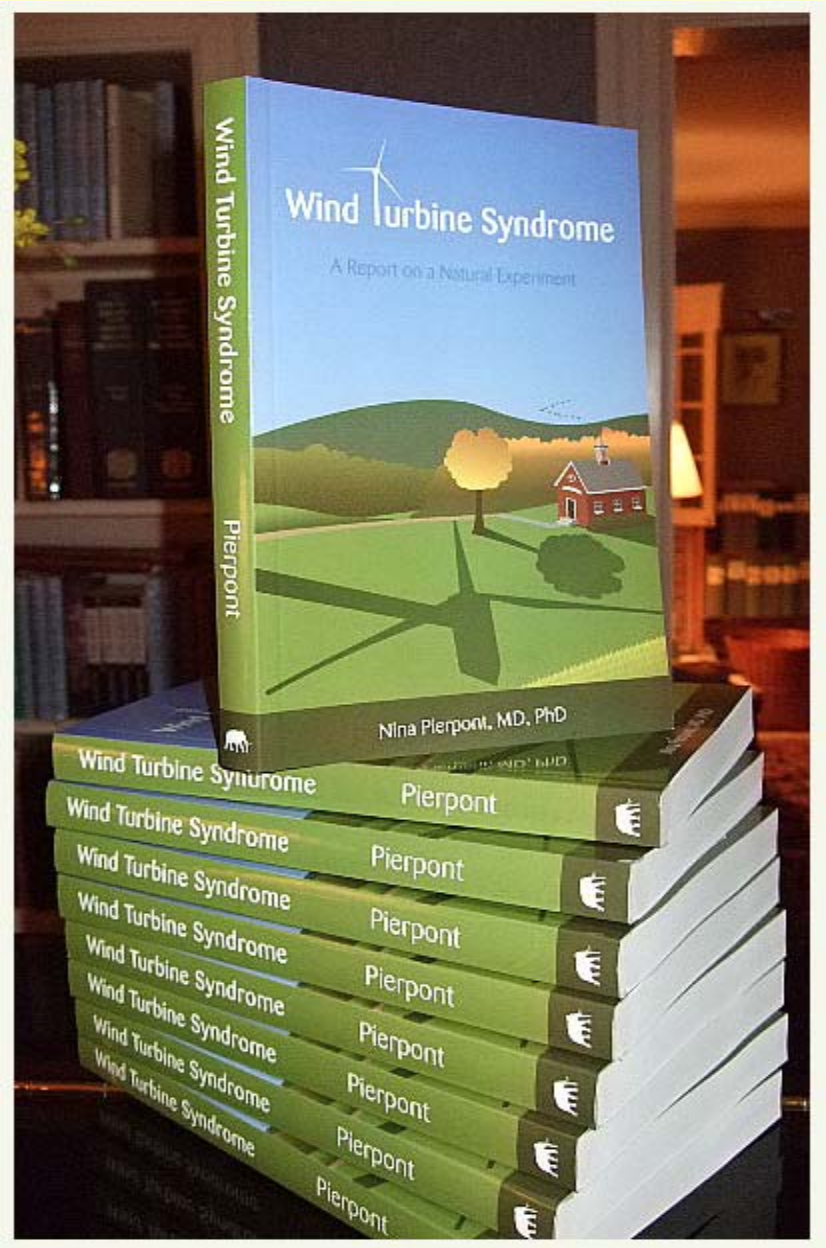
Wind Turbine Syndrome - an Appraisal

Geoff Leventhall



"Wind Turbine Syndrome - A Report on a Natural Experiment"

Nina Pierpont

Self published by own publishing house.

Sold only through own web page

Publication –originally promised for Aug 2008

Actual Publication - Dec 2009

Syndrome

A complex of symptoms indicating the existence of an undesirable condition or quality.

(Answers.com)

Assumed Mechanism for WTS

1. Inaudible low level infrasound at 1-2Hz activates the vestibular system and vibrates the chest
2. Inaudible low level infrasound at 4-8Hz enters the mouth and lungs and disturbs the diaphragm etc, leading to visceral vibratory vestibular disturbance - VVVD

WT Noise Levels

van den Berg - External		Hrg Thresh
1Hz	70 – 100 dB	130??dB
10Hz	55 – 75 dB	98dB
100Hz	50 – 60 dB	27dB

Hayes - Internal	
1Hz	60 – 70 dB
10Hz	40 – 60 dB
100Hz	25 – 35 dB

Internal and External are not at the same location

These are in accord with Kamperman and James at 1000ft

Symptoms of WTS

Symptoms include sleep disturbance, headache, tinnitus, ear pressure, dizziness, vertigo, nausea, visual blurring, tachycardia, irritability, problems with concentration and memory, and panic episodes associated with sensations of internal pulsation or quivering which arise while awake or asleep.

Summarised from book page 193

Hypothesis 1

"Wind Turbine Syndrome, I propose, is mediated by the vestibular system - by disturbed sensory input to eyes, inner ears, and stretch and pressure receptors in a variety of body locations. …… Several lines of evidence suggest that the amplitude (power or intensity) of low frequency noise and vibration needed to create these effects may be even lower than the auditory threshold at the same low frequencies. Restating this, it appears that even low frequency noise or vibration too weak to hear can still stimulate the human vestibular system opening the door- for the symptoms I call Wind Turbine Syndrome. I am happy to report, there is now direct experimental evidence of such vestibular sensitivity in normal humans." Book Page 13

Comments on Hypothesis 1 (1)

"Several lines of evidence" requires references – none given

"Direct experimental evidence" is followed by reference to paper by Todd et al. This paper has been misunderstood and misrepresented by Pierpont. The paper is entirely about vibration input to the mastoid area and detection by the cochlea and semicircular canals. It is not about noise.

Pierpont's use was subsequently repudiated by Todd (Aug 2009), but it was left in the book

From Pierpont's web page 1 Feb 2009 – Aug 2009

"In an article titled "Tuning and sensitivity of the human vestibular system to low-frequency vibration," three British scientists have demonstrated that the inner ear is "extremely sensitive" to extremely low levels of low frequency noise…..

"This is precisely what Nina Pierpont has been talking about. This new research offers substantial support for her claim that *a perturbed vestibular apparatus* is one of the keys to explaining Wind Turbine Syndrome……"

www.windturbinesyndrome.com/?p=1745

From Pierpont's web page 2 Feb 2009 – Aug 2009

A quotation from Todd et al paper:

"The very low [noise] thresholds we found are remarkable as they suggest that humans possess a frog- or fish-like sensory mechanism which appears to exceed the cochlea for detection of substrate-borne low-frequency vibration and which until now has not been properly recognised…. A fundamental question is also raised as to the possible behavioral consequences … such a mechanism may have".

[noise] not in the original. Inserted by Pierpont

Todd's response - Independent on Sunday 9th August 2009

Our research is being cited to support the case that "wind turbine syndrome" is related to a disturbance of vestibular apparatus produced by low-frequency components of the acoustic radiations from wind turbines. Our work does not provide the direct evidence suggested. We described a sensitivity of the vestibular system to low-frequency vibration of the head, at about 100Hz, and not air-conducted sound.

At present I do not believe that there is any direct evidence to show that any of the above acoustico- physiological mechanisms are activated by the radiations from wind turbines. Even if the vestibular system were activated in a controlled acoustic environment, it is not necessarily the case that it would produce pathological effects. Until such evidence is available I have an open mind on "wind turbine syndrome".

PAID ADVERTISEMENT

Wind Turbines & Infrasound: What the latest research says

Inserted by Pierpont

"At night the wind turbines cause a low pitched thumping [i.e., infrasonic] sound superimposed on a broadband 'noisy' sound, the 'thumps' occurring at the rate at which blades pass a turbine tower.... The number and severity of noise complaints near the wind park are at least in part explained by the two main findings of this study: actual sound levels are considerably higher than predicted, and wind turbines can produce sound with an impulsive character."

-- Professor Frits G.P. van den Berg, University of Groningen, the Netherlands, November 2004 (see excerpts from research articles, below)

(Malone Telegram, Feb 26, 2005)

Hypothesis 2 - visceral vibratory vestibular disturbance

"…. I propose the following mechanism for VVVD. Air pressure fluctuations in the range of 4-8 Hz, which may be harmonics of the turbine blade-passing frequency, may resonate (amplify) in the chest and be felt as vibrations or quivering of the diaphragm with its attached abdominal organ mass (liver). Slower air pressure fluctuations, which could be the blade-passing frequencies themselves or a lower harmonic (1-2 Hz), would be felt as pulsations as opposed to the faster vibrations or quivering. …..The pressure fluctuations in the chest could disturb visceral receptors……. These aberrant signals from the visceral graviceptors, not concordant with signals from the other parts of the motion-detecting system, have the potential to activate the integrated neural networks that link motion detection with somatic and autonomic outflow, emotional fear responses, and aversive learning."

Book page 78

Comments on Hypothesis 2 (1)

1-2Hz disturbs vestibular system and is felt in chest

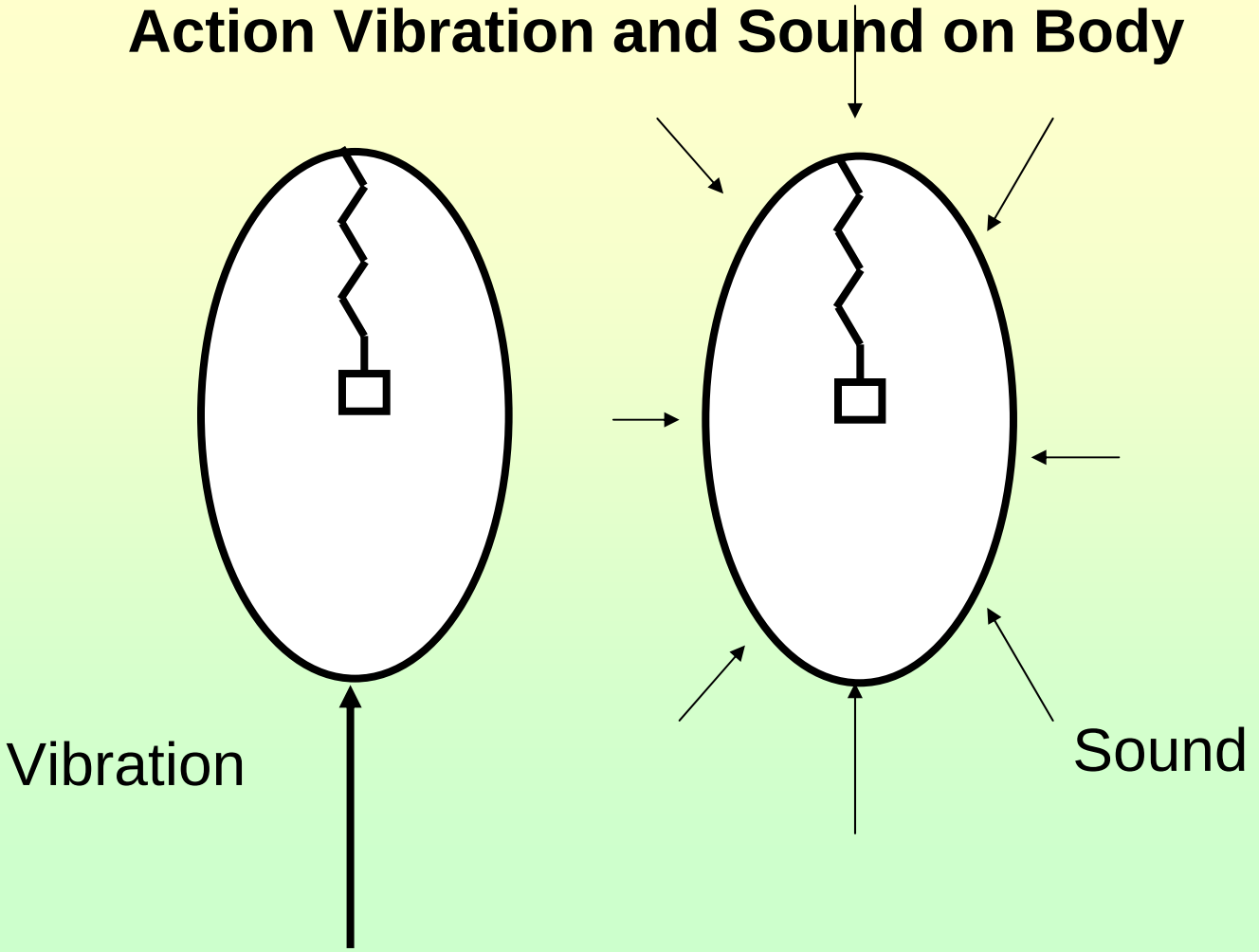
Here is a heart, beating in the 1-2Hz range

Comments Hypothesis 2 (2)

Supported by references to mechanical vibration of the body – standing or seated person – which gives 4-8Hz resonance

Mechanical excitation not the same as acoustic excitation

Action Vibration and Sound on Body



VVD and the diaphragm

Consider a pressure of, say, 74dB = 0.1N/m^2
Mass of diaphragm and liver ~1.75kg
Area of diaphragm ~ 0.1 m^2 F=p.A
Leads to acceleration of a=F/m ~0.006m/s^2

If this is sustained for 50ms, displacement s, from s=$^1/_2$ at^2 is

~7.5 micron. Quivering????

Note: 50ms = T/4 at 5Hz

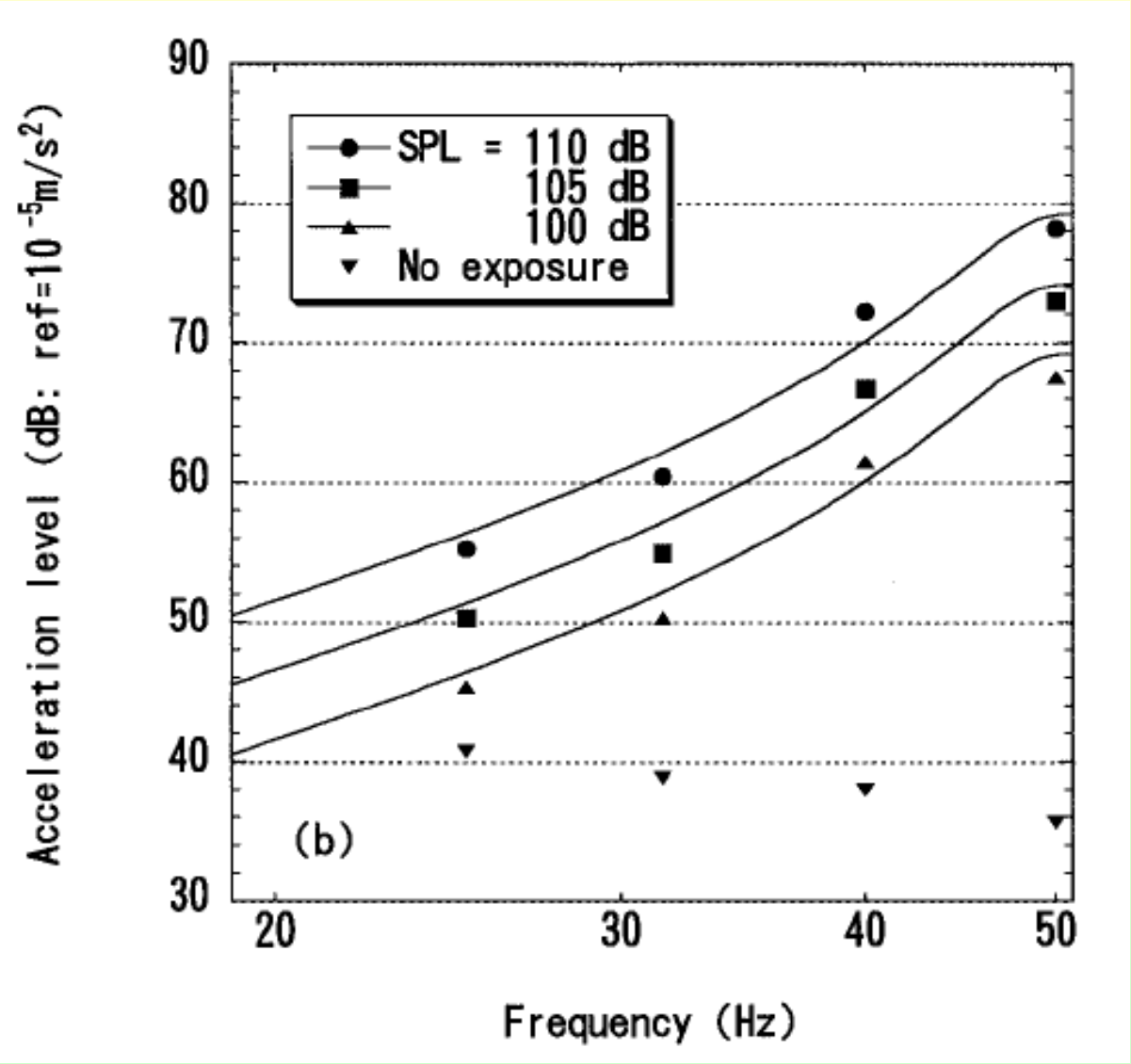
Internal body sounds/vibration

The body is a noisy system at low frequencies. Heart, circulation, muscle vibrations etc, including from the diaphragm, can be picked up externally, as radiated sound or surface vibration.

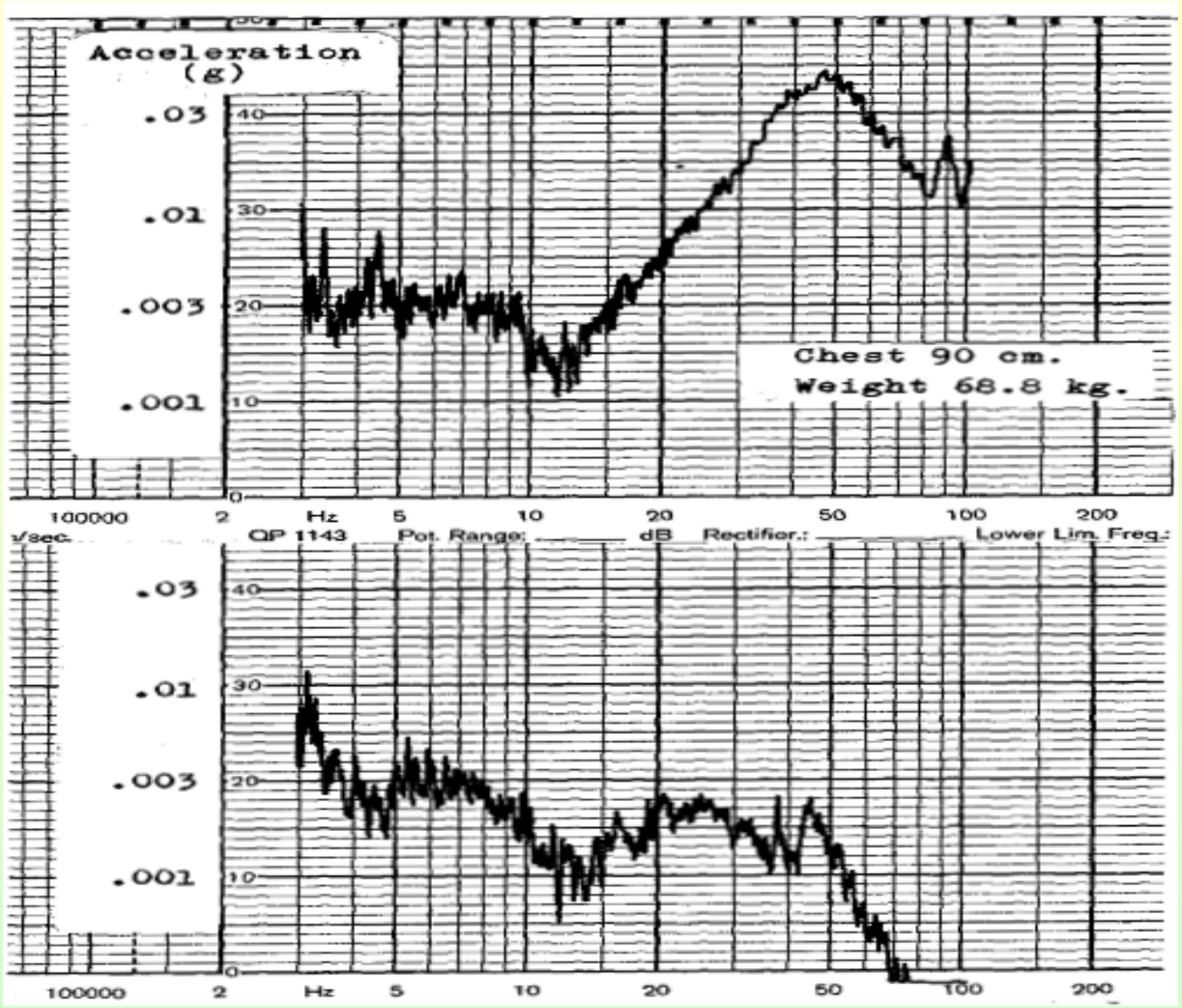
Body sounds are used for diagnosis e.g. heart murmer, breathing sounds etc.

Measurements of body vibrations in noise show masking by internal body sounds at LF.

External sounds entering the body are masked by internal sounds



Forehead vibration - Takahashi



Chest resonance at 107dB excitation and background vibration – Leventhall et al

Obtaining Subjects

Call sent out e.g. Country Guardian March 4 2006

"Dr Pierpont is asking anyone living near wind turbines and suffering ill health effects of whatever sort he/she suspects are a result of the wind turbine—asking these people to contact her……..She will do a telephone interview……Dr Pierpont's study will be published in a leading clinical medical journal sometime in the next 12 months…"

Study based on 10 families, < 40 people

Case studies

Based on results of telephone interviews - 10 families < 40 members

Criticised on epidemiological grounds of self selection, small number etc

Results already well known - not new, except forgiving more information on effects of existing health problems

Comparison: Pierpont and the Hum

sleep disturbance, headache, tinnitus, ear pressure, dizziness, vertigo, nausea, visual blurring, tachycardia, irritability, problems with concentration and memory, and panic episodes associated with sensations of internal pulsation or quivering which arise while awake or asleep”

insomnia; headache; pressure in the ears or head;

Dizziness; nausea;

eye strain; fatigue; distraction;

nose bleeds;

feeling vibration; muscle spasms;

palpitations; skin burning; stress; tension etc

-Windustry February 2010

Previous work has shown similar effects

Pierpont has not made new discoveries.

She is describing stress effects of low level noise, which occur with a *small number* of people.

These effects have been published a number of times previously and are well known to those experienced at the "street level" of environmental noise problems.

It appears that there is no specific Wind Turbine Syndrome, but there are stress effects from low levels of noise, either high frequency or low frequency noise, which affect a small number of people. It is the audible swoosh- swoosh which, when it occurs, is the cause, not infrasound or low frequency noise

Conclusions on WTS

Mechanisms - unproven > implausible

Case studies - not new info

Scientific merit - marginal

Social merit - negative (nocebo)

And finally - a quote from Pierpont about other people's studies

Wind Turbine Syndrome pg 252

"Let me be emphatic. *You can't start with an implausible hypothesis or a flawed data set and get a result which means anything*"

-Windustry February 2010