Heart Rate Variability (HRV) as a Diagnostic Tool in Electrohypersensitivity (EHS)

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Electrohypersensitivity & Heart Problems

Heart palpitations
arrhythmias
low or high blood pressure
pain or pressure in the chest

Severity of Symptoms (n=75)

Self-proclaimed electrosensitivity of participants.

How quickly do you RESPOND?

First Study: (n=25)
Second Study: (n=75)
Self-proclaimed electrosensitivity of participants.

How quickly do you **RECOVER**?

**First Study:** (n=25)  
- Days: 20, 12, 10, 4, immediately  
- Minutes: 30, 10

**Second Study:** (n=75)  
- Days: 17, 10 minutes, 9, 5, 4, immediately  
- Minutes: 30, 5, 4

“Proof of Concept” Provocation Study

Do cordless phones affect the heart?

**ICNIRP/US/Canadian Cordless Phone Guideline**

- **Frequency (GHz):** 2.4  
- **Intensity (microW/cm²):** 1000 (540), 3

0.3% R-R Interval

- Time between beats: 1 sec  
- Faster: 60 bpm  
- Slower: 1 bpm

Rhythmograph

- ~100 cm  
- Electrode belt with transmitter  
- Receiver  
- Sham exposure  
- Live  
- Dead
Double Blind Study

Orthostatic Test

Professional athlete

Dr. Jeff Marrongelle

supine  transition  upright

supine  transition  upright

False Negative

Can’t Test

False Positive

top athletes

fatigue

long-term fitness

Graphical Representation of the Physical Fitness

short-term fitness

chronically ill

Figure 1. Examples of the Nerve Express orthostatic rhythmograph for different conditions.
Continuous monitoring of heart digital cordless phone provocation

Subject A
- Pre-exposure: 58 bpm
- Phone: 56 bpm
- Sham: 58 bpm

Subject B
- Phone: 68 bpm
- Sham: 122 bpm
- Sham: 66 bpm
- 129 bpm

Subject C
- Phone: 65 bpm
- Phone: 65 bpm

Subject D
- Exposed: 60 bpm
- Exposed: 66 bpm
- Exposed: 69 bpm

Tachycardia

Figure 3. Physical fitness based on the orthostatic test. Fitness decreases as one approaches the lower right corner of the graph. A fitness score at and above 10 (horizontal axis) indicates fatigue. The relative fitness of the four examples decreases from A (6:1) to D (12:7).

Real Time Monitoring
Subject C: Reactive

Gender: Female
Age: 56 years
Height: 5'6"
Weight: 156 lbs
Blood Type: O+
Sitting HR: 66
Blood Pressure: 123/76
Blood Sugar: 5.0 mmol/L
Time Since Last Meal: 0.5 hr

“fight or flight” stress response

up-regulating sympathetic

parasympathetic
down-regulating
Question:

Are the results **real** or are they an **artifact** due to **electromagnetic interference (EMI)**?

Was the **radiation** from the **cordless phone** interfering with the **receiver** and giving a **false reading** or was it interfering with the **heart**?

Test for Interference
Exposure Protocol

cordless phone & heart

<table>
<thead>
<tr>
<th>PHONE NEAR</th>
<th>DISTANCE from receiver (cm)</th>
<th>RADIATION at receiver (µW/cm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEAD</td>
<td>80 - 110</td>
<td>2 - 3</td>
</tr>
<tr>
<td>HEART</td>
<td>~5</td>
<td>100 - 200</td>
</tr>
</tbody>
</table>

Female-50s: HRV does not react to 2.4 GHz

[ December, 2011 ]

Changes detected:
1. heart rate: NO change
2. HRV: NO change
3. sympathetic: NO change
4. parasympathetic: down?

Subject F: Non-Reactive

Subject with moderate fatigue

Subject G

Delayed Reaction

Subject H
Interference?

Students need to be screened at school to ensure that they do not have an underlying heart condition that may be exacerbated with Wi-Fi exposure.

In the interest of occupational hygiene . . . investigators have recommended that cardiovascular abnormalities be used as screening criteria to exclude people from occupations involving radio-frequency exposures.

Mountain View School: Wi-Fi
1. 6-year old girl, “musical heart”, headaches, dizziness only at school.
2. 12-year old boy, tachycardia.
3. 12-year old girl, nausea, vomiting, no fever, insomnia, blurred vision, tachycardia (only at school).
4. 13-year old boy, heart pounding, insomnia, headaches, moved & symptoms abated.

- in Simcoe County, 4 students experienced sudden cardiac arrest in the past school year (2 died)
- incidence of adolescent cardiac arrest is 40 x higher than the expected national average
- youngest child - 13 years old

Source: www.safeschool.ca

Solution–defibrillators!

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Provocation study using heart rate variability shows microwave radiation from 2.4 GHz cordless phone affects autonomic nervous system

Students need to be screened at school to ensure that they do not have an underlying heart condition that may be exacerbated with Wi-Fi exposure.
Wi-Fi & Blood

Wi-Fi & Plant Growth

Thank You!

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