Heart Coherence - Dan Winter

Musical ratios ??
Harmony ??
Coherence ??

Cascade

Begin... EKG data Ch A, EEG Ch B

frequency in Hz
Heart Coherence - Dan Winter

raw data of electrical pulses

Heart Coherence - HeartMath

Heart Rate Variation
H R V & Respiration => RSA
HRV Coherence was originally defined as the size of the biggest LF peak compared to the amplitude of the broad HRV spectra (VLF+LF+HF).

This way of analysis assumes you are breathing at a constant and fixed frequency (using a pacer around 0.1 Hz - 6 cycles/minute) during the breathing session.

If the frequency of your breathing is changing during the session, the LF peak will be larger and its size will be affected, resulting in a lower coherence value.

3 bands are usually described in HRV spectrum:

- **The VLF band** (up to 2.4 cycles per minute)
- **The LF band** (9 to 24 cycles per minute)
- **The HF band** (9 to 24 cycles per minute)
Broad spectra Coherence (FFT3)

also taking care of **ALL**
good or 
bad music notes!!
Another way to analyse the coherence from the heart HRV spectrum, is to analyse the relationship between all the peaks present in the spectrum. The more these peaks will be related to musical (or golden) ratios, the more your HRV will be coherent (harmonic inclusiveness, fractal).

We have developed a new kind of mathematical analysis of 3rd order FFT (Fast Fourier Transform) of the broad HRV spectra.

The musical relationship between the peaks is defined by musical (or golden) ratios. These ratios are related by the respective sizes of the peaks and their relative position in the spectrum.

This could be visualized as an analysis for regularly spaced patterns in the shape of the purple line linking all the peaks of the spectrum.
white curve: single peak Coherence analysis
pink curve: 3rd order FFT Coherence (FFT3) of the whole HRV spectrum
orange curve: VLF Stress
light blue curve: LF Stress
dark blue curve: HF Stress

VLF Stress is related to short term stress;
LF Stress is related to long term stress;
HF Stress is related to emotional baggage.

Coherence peak of the 3rd order FFT analysis (of the broad HRV spectra)
The vertical white line is at 0.1 Hz (6 cycles/min).

Touch the buttons to show/hide the curves
Press STOP to finalize the session and access graphic analysis.
Touch the top buttons to display different graphs.
Dash Board of a training breathing record

- Date: 2016-05-09 15:33
- iHealth Sensor
- VLF: 24%
- LF: 61%
- HF: 25%
- LF/HF: 2.00
- LF1: 6.0 / min
- LF2: 7.0 / min
- LF3: 7.8 / min
- LF 3/2: 1.11
- LF 3/1: 1.29
- LF 2/1: 1.17
- Beats + Harmonics
- Beats keys

- CY: 8.0 / min
- CY: 8.0 / min
- CY: 244
- CY: 105
- %: 83% 37% 46% 54% 81% 19%

Graphs 161222
Coherence display options:
full FFT3 coherence vs simple dominant harmonic amplitude coherence
see: «How iTHRVE measures coherence»
HRV % Coherence evolution over time

Options to display graphs:

- Long Term Stress Level
- Short Term Stress Level
- LF/HF
- FFT3: heart/breath Coherence (by third order spectrum analysis)
- Coherence curve by simple single dominant harmonic amplitude
Night Heart Rate Analysis

The top bar displays the colours related to the selected activities during the running time of your recording.

Two ways of HRV display:
- orange: below 60
- green: between 60 & 70
- yellow: between 70 & 80
- red: above 80 (beats /minute).

- BARS: Show/Hide top heart rate bar display.
- MIN: Minimum heart rate
- MEAN: Mean heart rate
- MAX: Max heart rate
- MinMax: Minimum to Maximum heart rate
Night Heart Rate Analysis

**MinMax** (Minimum to Maximum heart rate) shows the amplitude of the HRV

Deep HRV amplitude:
- **Young & healthy**

Lower HRV amplitude:
- **Old, less healthy or stressed**
If Night Movements are selected, place the iPhone near your pillow and make a small test record to check if your device can catch small movements (see next slides).
The light blue part (deep sleep - lower VLF/HF) of the night graph analysis will be updated in the Progress/History graph.
Analysis of the movements during the night