Cardiac coherence & Autogenic Training

Dr. Luis Hernández Herrero
Instituto de Psicoterapia e Investigación Psicosomática, Madrid
What is Cardiac Coherence (CC)?

CC is a **particular state of Heart Rate Variability** that allows **physiological entrainment and synchronization of different body systems rhythms** (respiration, blood pressure, EEG...) with the rhythm generated by heart, thus leading to:

- minimize **body’s** stress response
- facilitate higher **cognitive** faculties
- facilitate higher **emotion** regulation abilities

From “Science of The Heart: Exploring the Role of the Heart in Human Performance. An Overview of Research Conducted by the Institute of HeartMath”

What is Heart Rate Variability (HRV)?

HRV is the degree of fluctuation in the length of the intervals between heart beats (Malik & Camm, 1995).
What is Heart Rate Variability (HRV)?

HRV reflects the influence of different stimuli (respiration, emotions...) through the sympathetic and parasympathetic nervous systems.

CNS: Central Nervous System. SN: Sinoatrial Node. HR: Heart Rate
What is Heart Rate Variability (HRV)?

Effect over heart rate of parasympathetic vs. sympathetic stimuli

bpm: beats per minute

Chen X., Mukkamala R. 2007
What is Heart Rate Variability (HRV)?

To discriminate and quantify sympathetic and parasympathetic activity we decompound the HRV into its constituent frequency components by means of Fast Fourier power spectral analysis.

The graphic on the right represents the Power Spectral Density (PSD) for the different frequencies.

**VLF**: Very Low Frequency. 0,003-0,04Hz

**LF**: Low Frequency. 0,04-0,15Hz

**HF**: High Frequency. 0,05-0,4Hz

ANS: Autonomic Nervous System
HRV during high stress

Tachogram (time axis) of HRV in a driver very stressed and trying to recover calm in a simulated race. Average HR 131bpm.

Spectral analysis (frequency axis) of the above HRV. Power distributes in three wide spikes, the bigger one centered on VLF domain (activation of SNS). The other two on HF domain (activation of PNS). Significantly, there’s a valley in LF domain.
HRV during Cardiac Coherence (CC)

“CC is a particular state of Heart Rate Variability”

Tachogram (time axis) of HRV in CC: Armonious, sinus-like wave at about 6 cycles per minute.

Spectral analysis of the above HRV (frequency axis): Power in form of narrow spike centered on 0.1Hz frequency, i.e. the LF domain, representing the synchronization between SNS and SNP.
Physiological entrainment during CC

Tachograms of HRV, Pulse transit time and Respiration of a person before and after entering in CC (he used a technique named Freeze Frame).

Spectrum analysis of the three systems before and after reaching CC.
Basic network of CC

Positive feeling

Heart in CC

Adapted blood pressure

Breath slow and armonious

Bidirectional positive influence
Differences between CC and relaxation
HRV during Autogenic Training (AT): Weight

Tachogram (time axis) of HRV during “my arms and legs are heavy” formula. Avg HR, 63bpm.

Spectral analysis of the above HRV (frequency axis)
HRV during Autogenic Training (AT): Limb's warmth

Tachogram (time axis) of HRV during “my arms and legs are warm” formula. Avg HR, 62bpm.

Spectral analysis of the above HRV (frequency axis)
HRV during Autogenic Training (AT): Heart

Tachogram (time axis) of HRV during “my heart goes natural” formula. Average HR, 61bpm.

Spectral analysis of the above HRV (frequency axis)
HRV during Autogenic Training (AT): Breathing

Tachogram (time axis) of HRV during “it breaths me” formula. Average HR, 62bpm.

Spectral analysis of the above HRV (frequency axis)
HRV during Autogenic Training (AT): Solar plexus

Tachogram (time axis) of HRV during “my solar plexus is warm” formula. Average HR, 64bpm.

Spectral analysis of the above HRV (frequency axis).
HRV during Autogenic Training (AT): Forehead

Tachogram (time axis) of HRV during “my forehead is fresh” formula. Average HR, 67bpm.

Spectral analysis of the above HRV (frequency axis)
HRV during CC & AT mix

Tachogram (time axis) of HRV during “my heart breaths happy” formula sync. with breathing

Spectrum Average

Spectral analysis of the above HRV (frequency axis)
HRV during mantra (to activate if drowsy driving)

Tachogram (time axis) of HRV during mantra “aaaaaah”. Avg HR, 68bpm.

Spectrum Average

Spectral analysis of the above HRV (frequency axis)
In Fundación LUIKE, with the scientific support of Instituto de Psicoterapia e Investigación Psicosomática and Luis de Rivera MD, we teach drivers techniques to manage stress, specifically designed from CC and EA methods.

Thank you very much!