

# Cardiac coherence & Autogenic Training

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# 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:

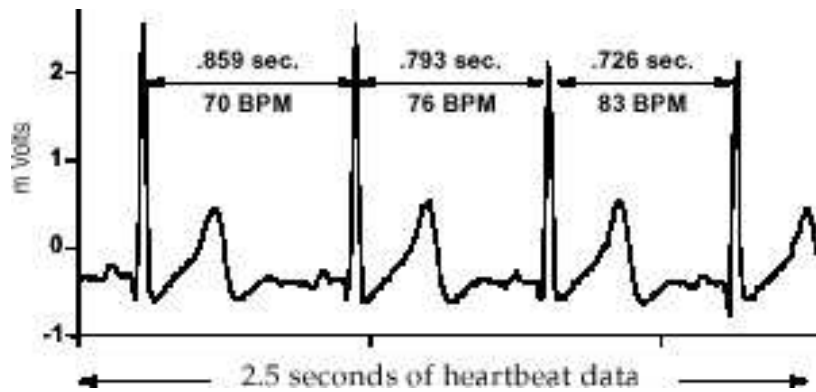
- minimize **body's** stress response
- facilitate higher **cognitive** faculties
- facilitate higher **emotion** regulation abilities

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

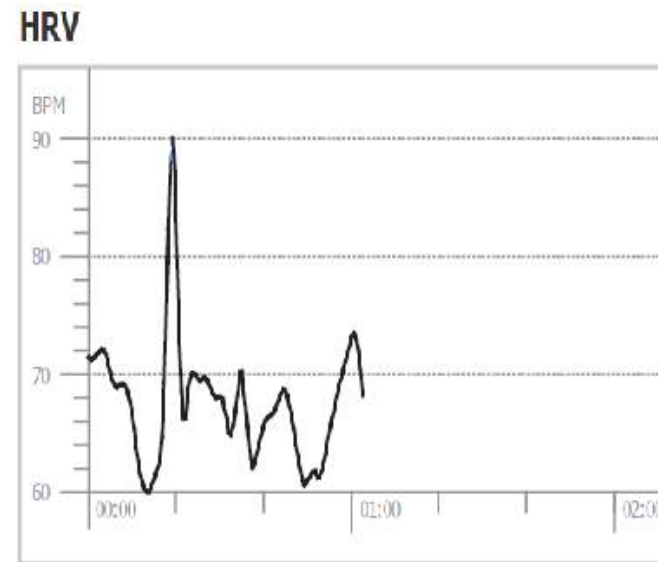
<http://www.heartmath.org/research/science-of-the-heart/introduction.html>

# What is Heart Rate Variability (HRV)?

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



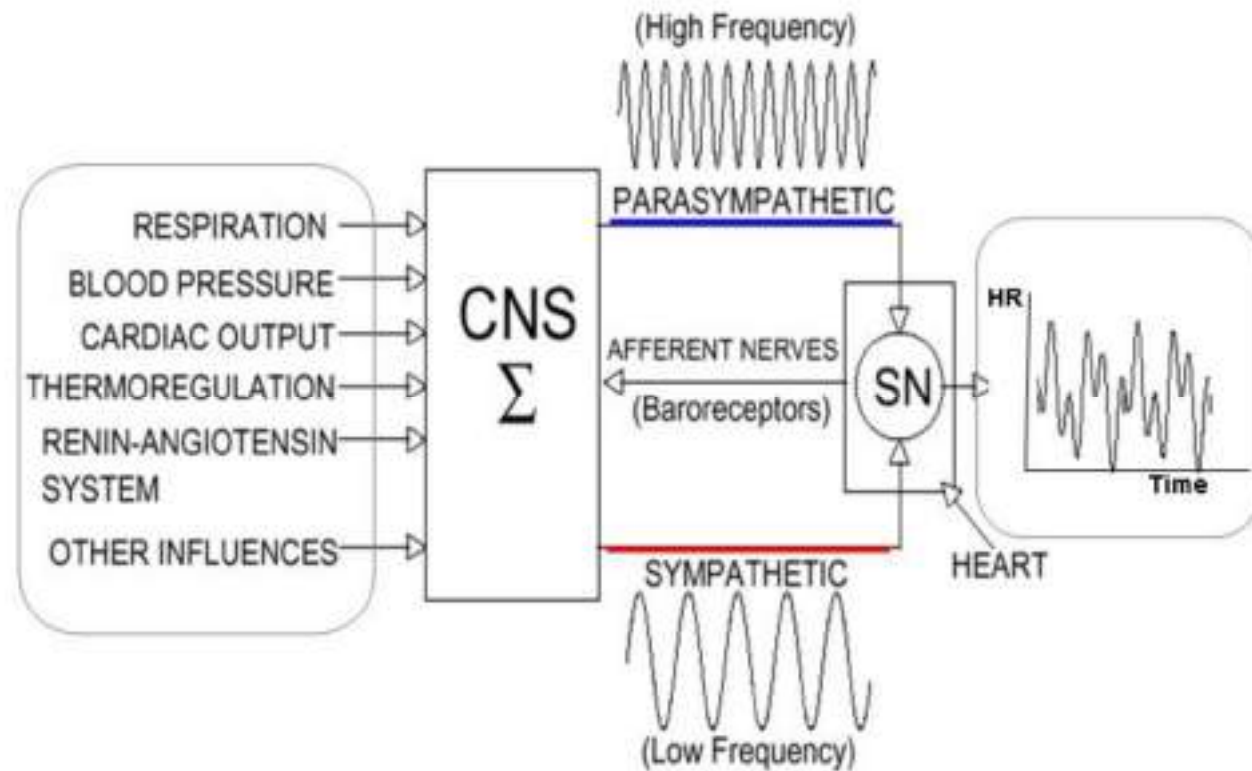
Electrocardiogram



Tachogram

# What is Heart Rate Variability (HRV)?

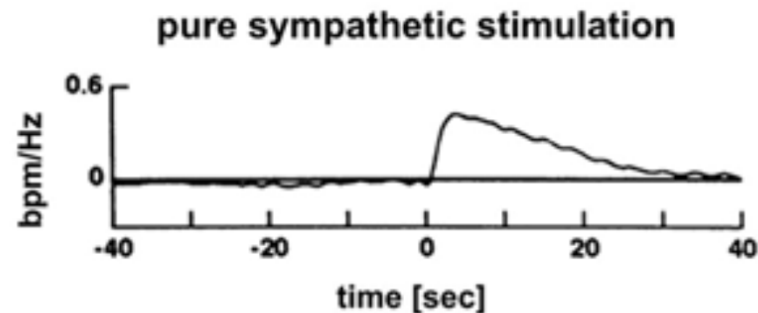
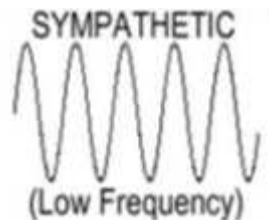
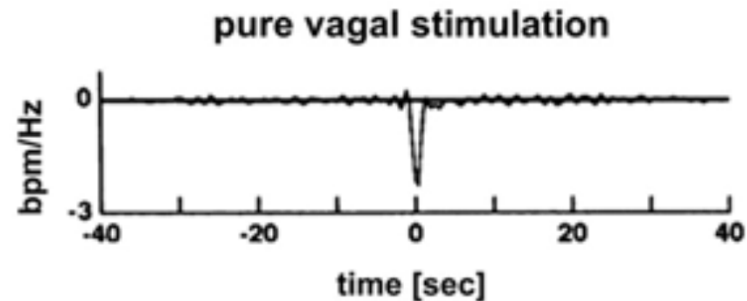
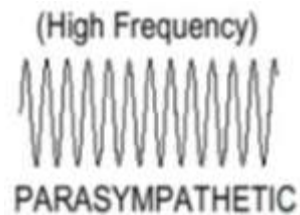
HRV reflects the influence of different stimuli (respiration, emotions...) through the sympathetic and parasympathetic nervous systems.



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



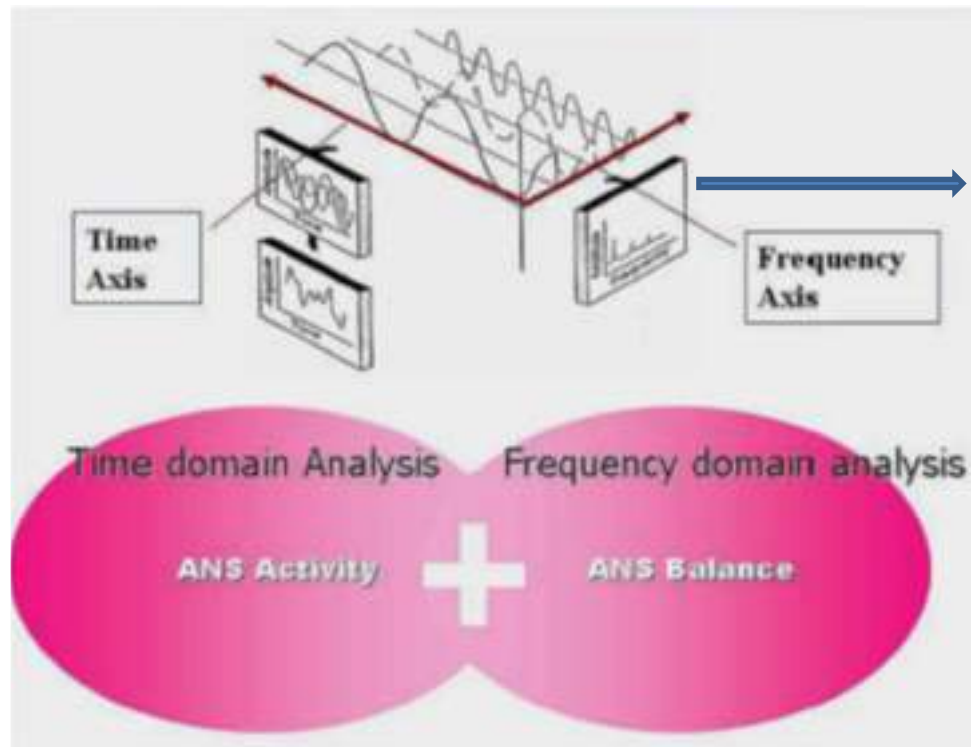
bpm: beats per minute

[Chen X., Mukkamala R. 2007](#)

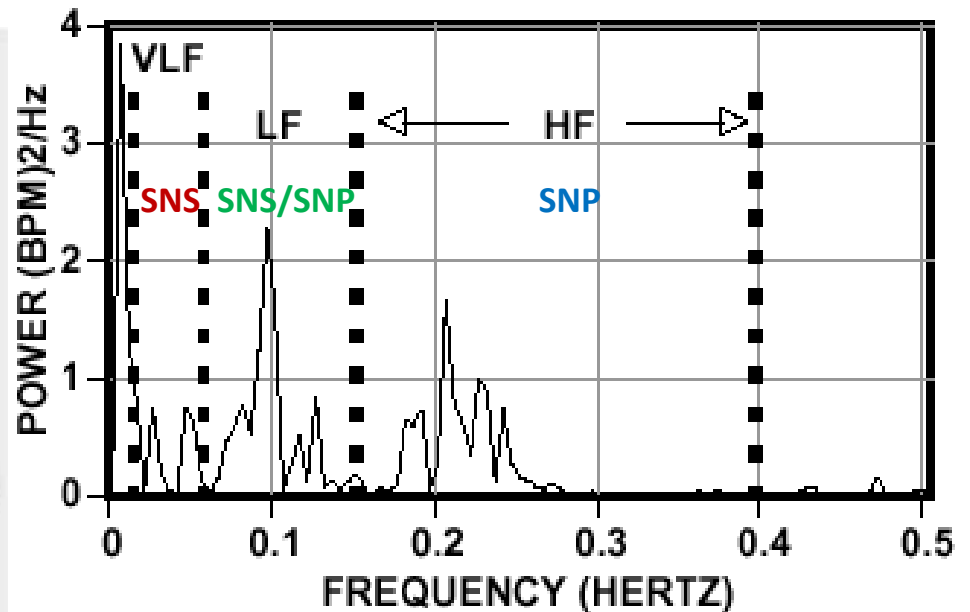
# What is Heart Rate Variability (HRV)?

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.



ANS: Autonomic Nervous System

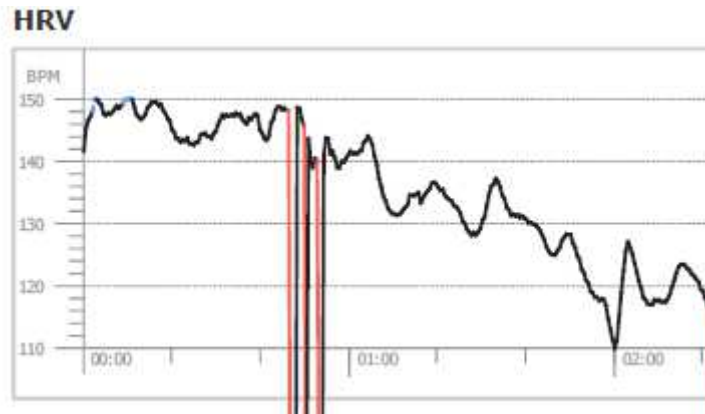


**VLF:** Very Low Frequency. 0,003-0,04Hz

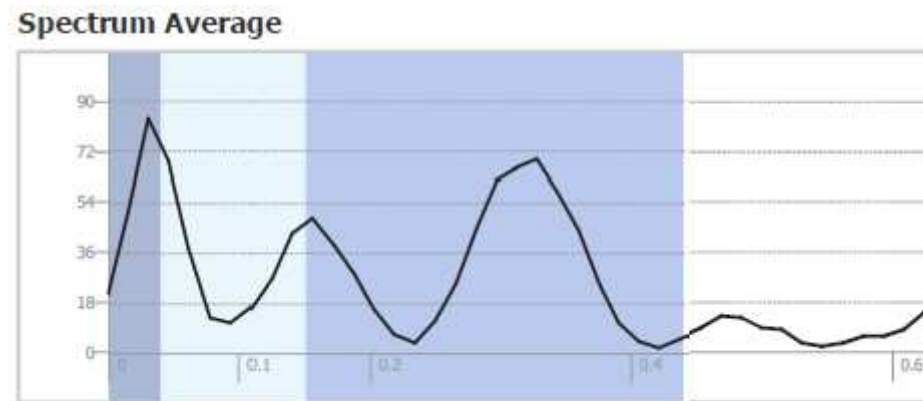
**LF:** Low Frequency. 0,04-0,15Hz

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

# HRV during high stress



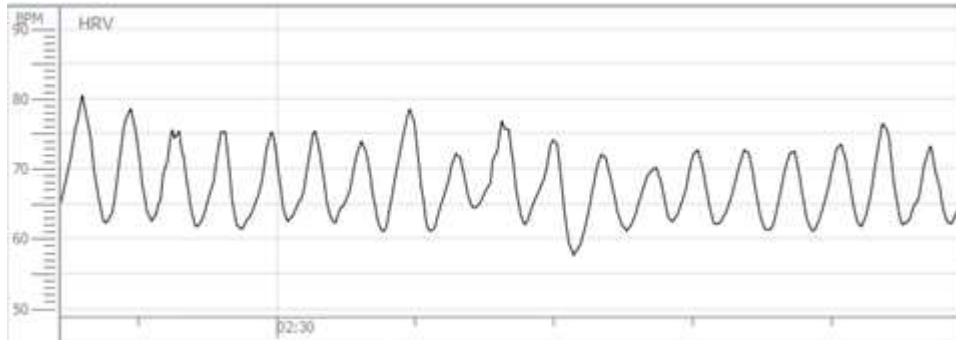
Tachogram (time axis) of HRV in a driver very stressed and trying to recover calm in a simulated race. Average HR 131bpm.



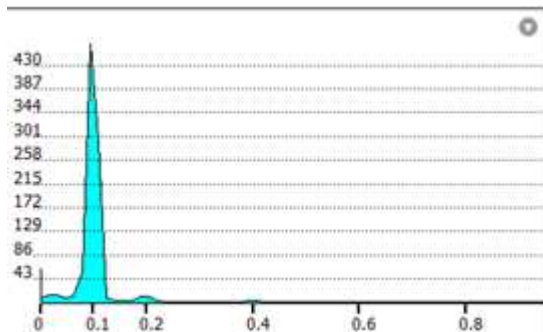
Spectral analysis (frequency axis) of the above HRV. Power distributes in three wide spikes, the bigger one centered on VLF domain (activation of SNS). The other two on HF domain (activation of PNS). Significantly, there's a valley in LF domain.

# HRV during Cardiac Coherence (CC)

“CC is a particular state of Heart Rate Variability”



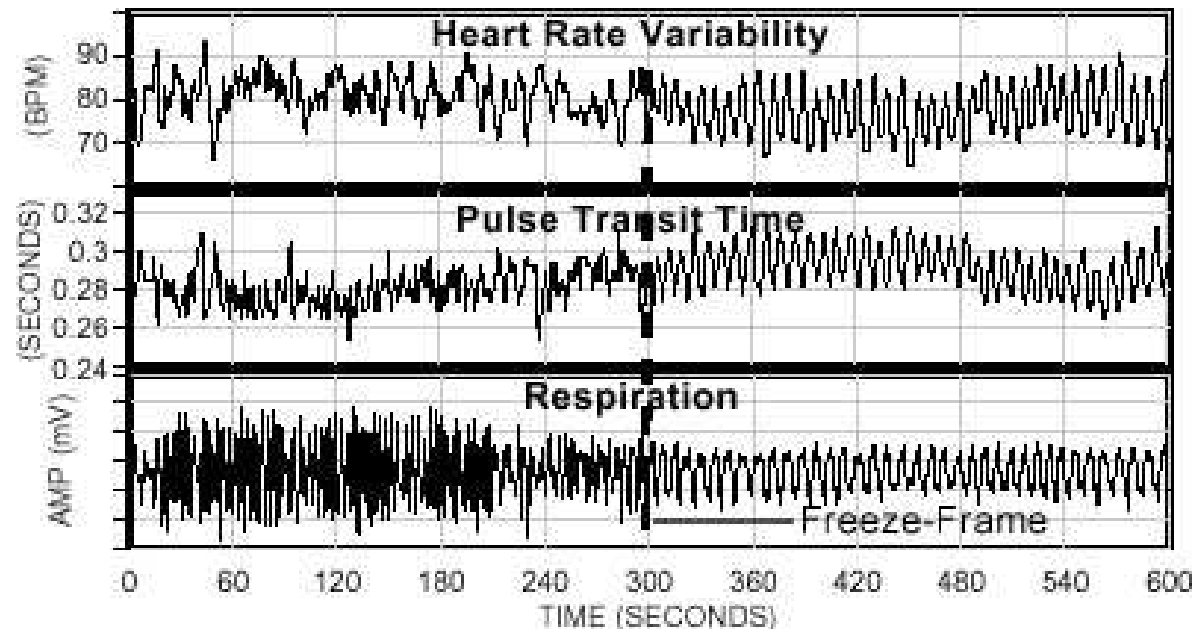
Tachogram (time axis) of HRV in CC: Armonious, sinus-like wave at about 6 cycles per minute.



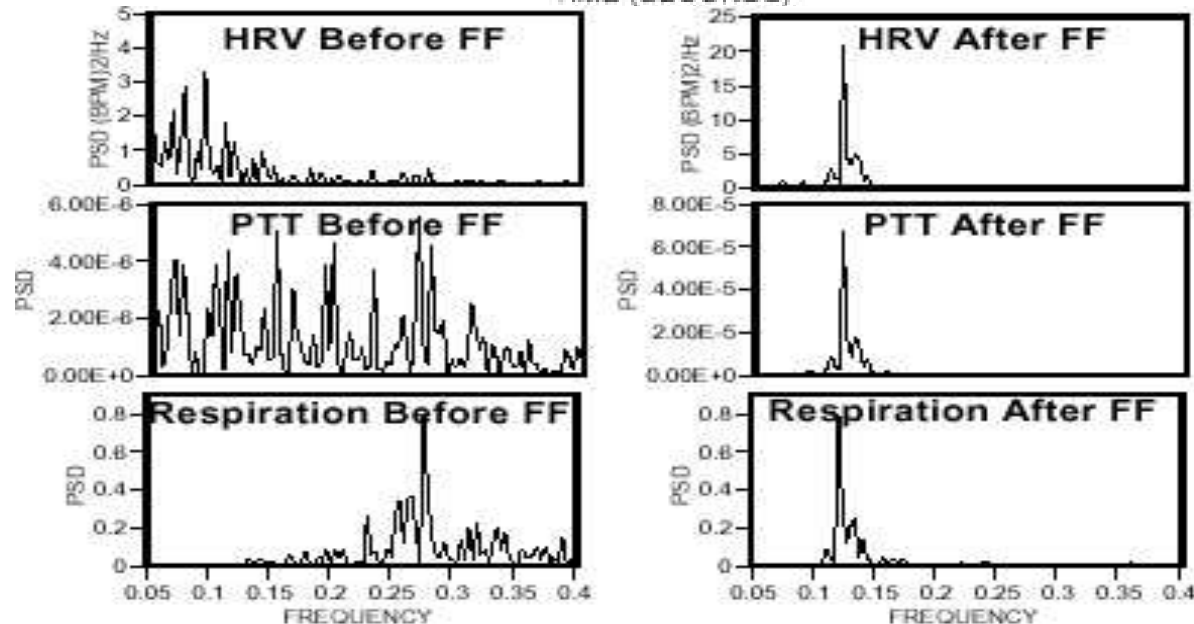
Spectral analysis of the above HRV (frequency axis): Power in form of narrow spike centered on 0,1Hz frequency, i.e. the LF domain, representing the synchronization between SNS and SNP.



# Physiological entrainment during CC

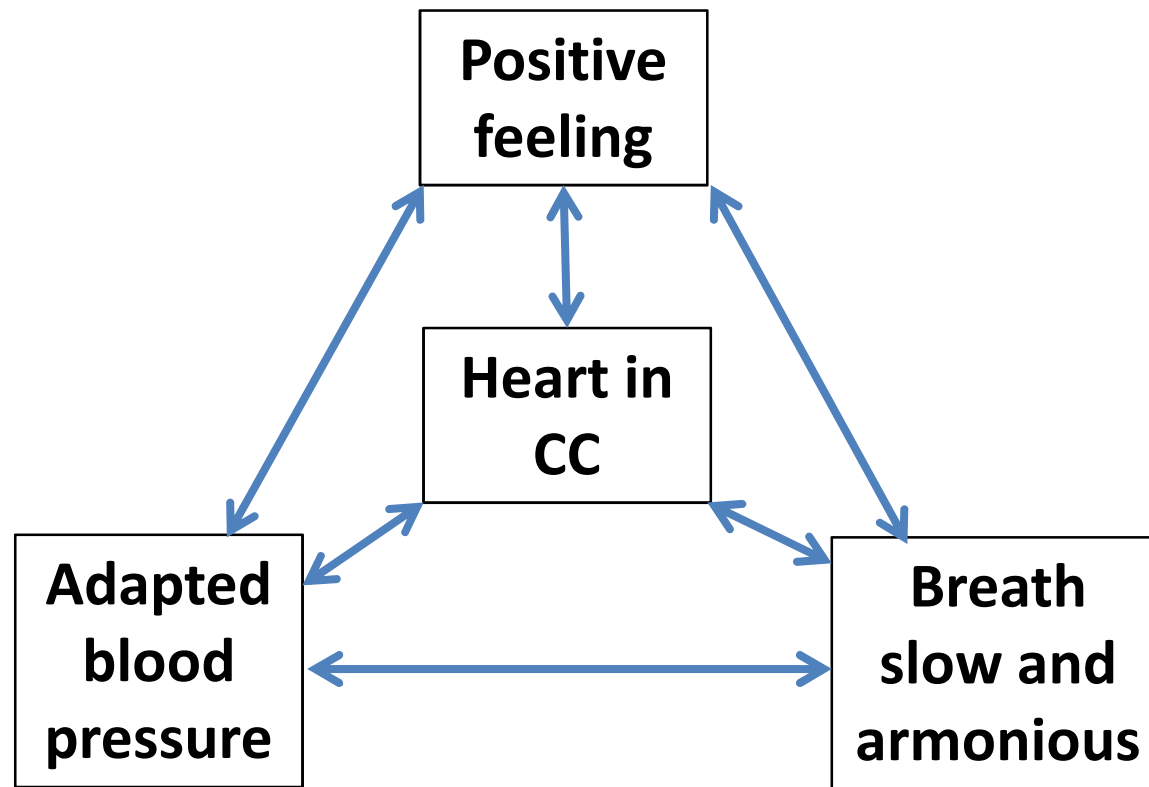


Tachograms of HRV, Pulse transit time and Respiration of a person before and after entering in CC (he used a technique named Freeze Frame).



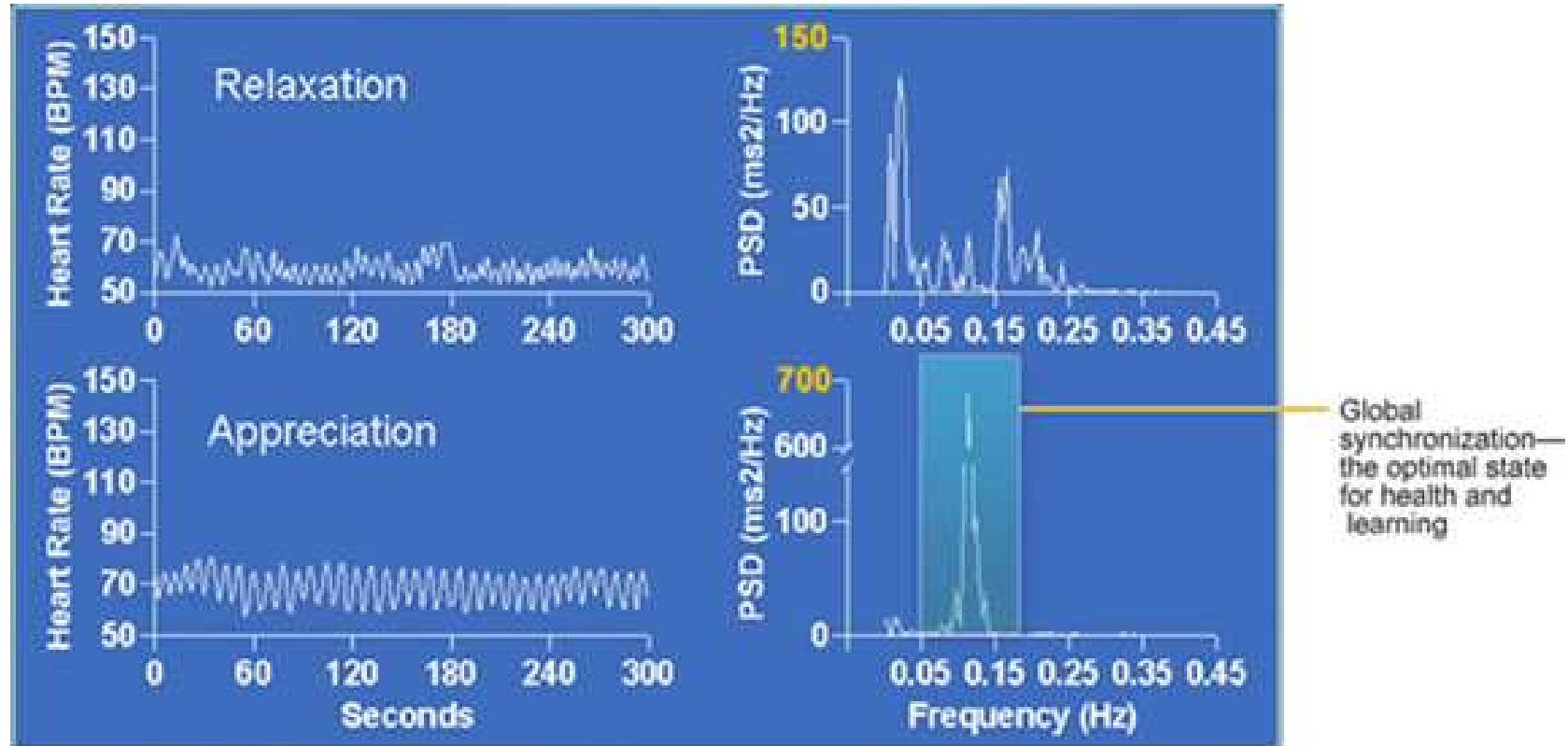
Spectrum analysis of the three systems before and after reaching CC.

# Basic network of CC



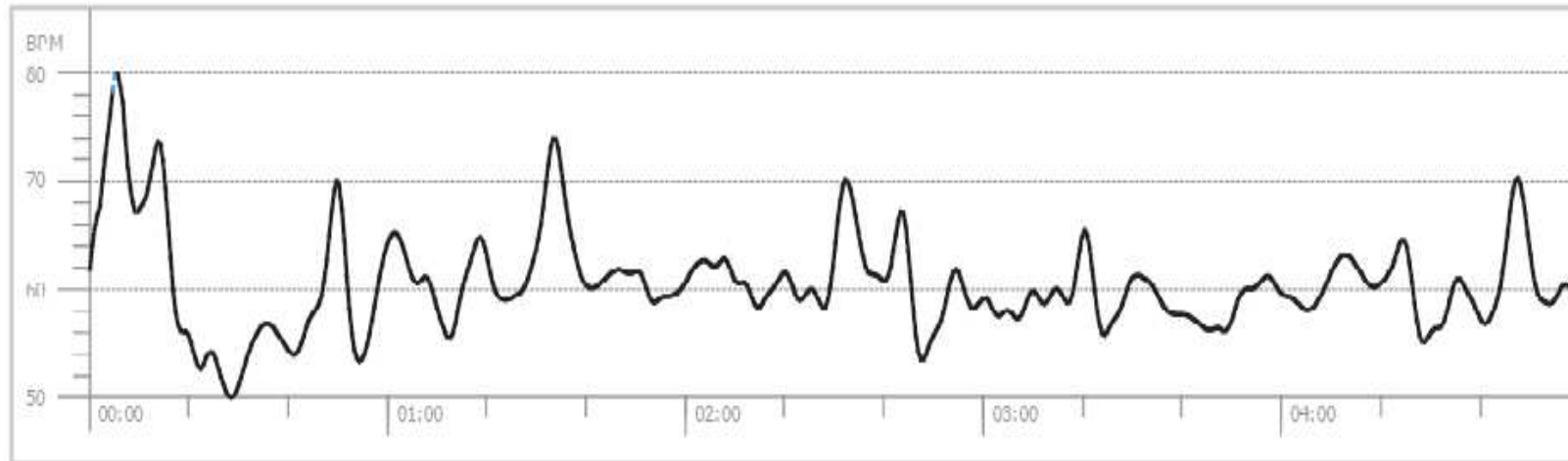
↔ Bidirectional positive influence

# Differences between CC and relaxation



# HRV during Autogenic Training (AT): **Weight**

## HRV



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

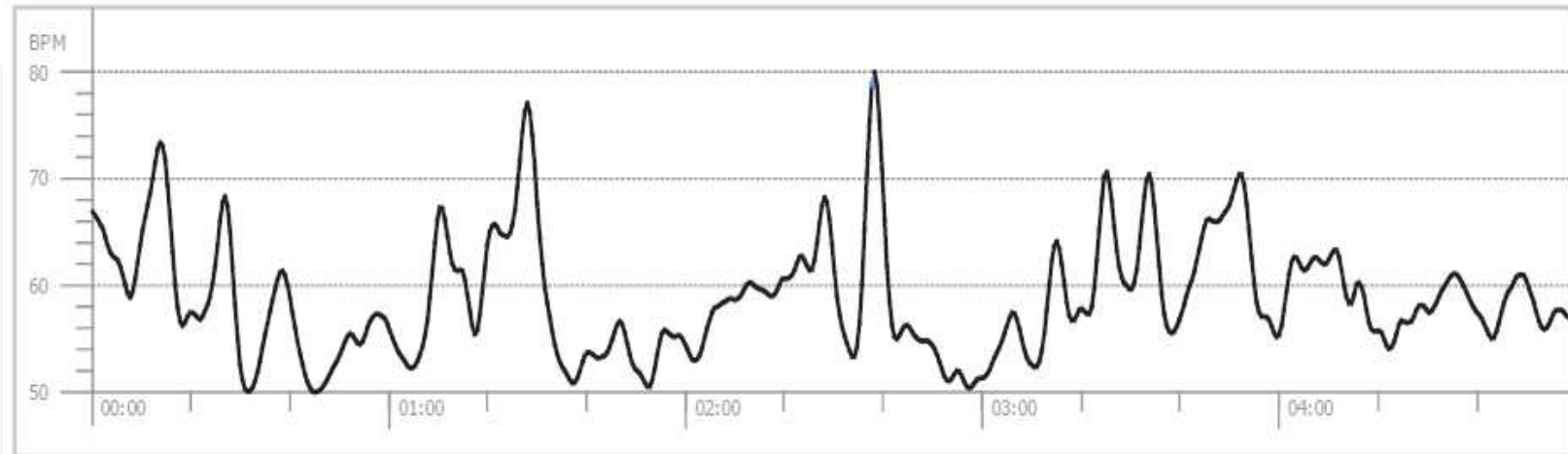
## Spectrum Average



Spectral analysis of the above HRV (frequency axis)

# HRV during Autogenic Training (AT): **Limb's warmth**

## HRV



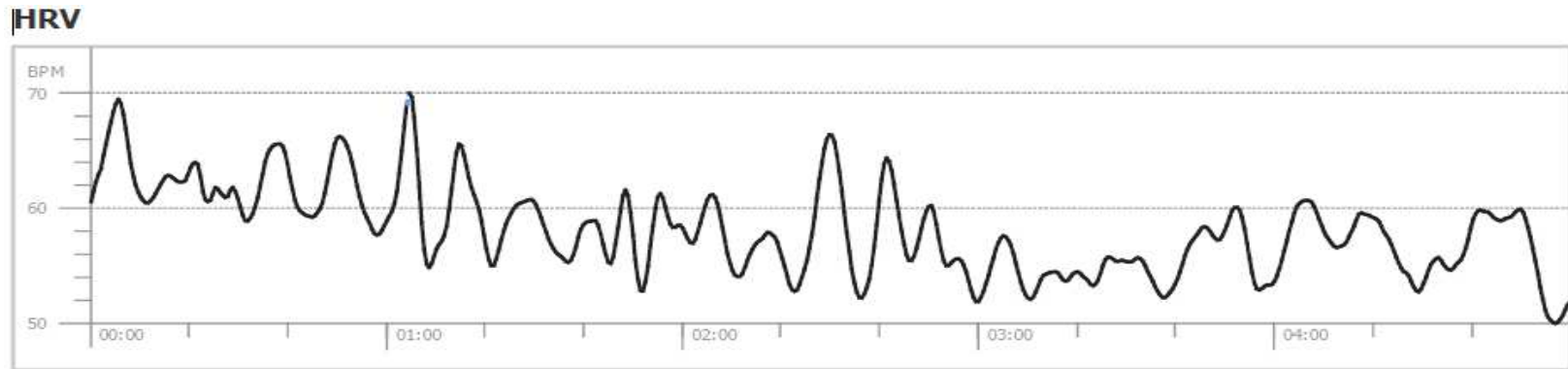
Tachogram (time axis) of HRV during **“my arms and legs are warm”** formula. Avg HR, 62bpm.

## Spectrum Average

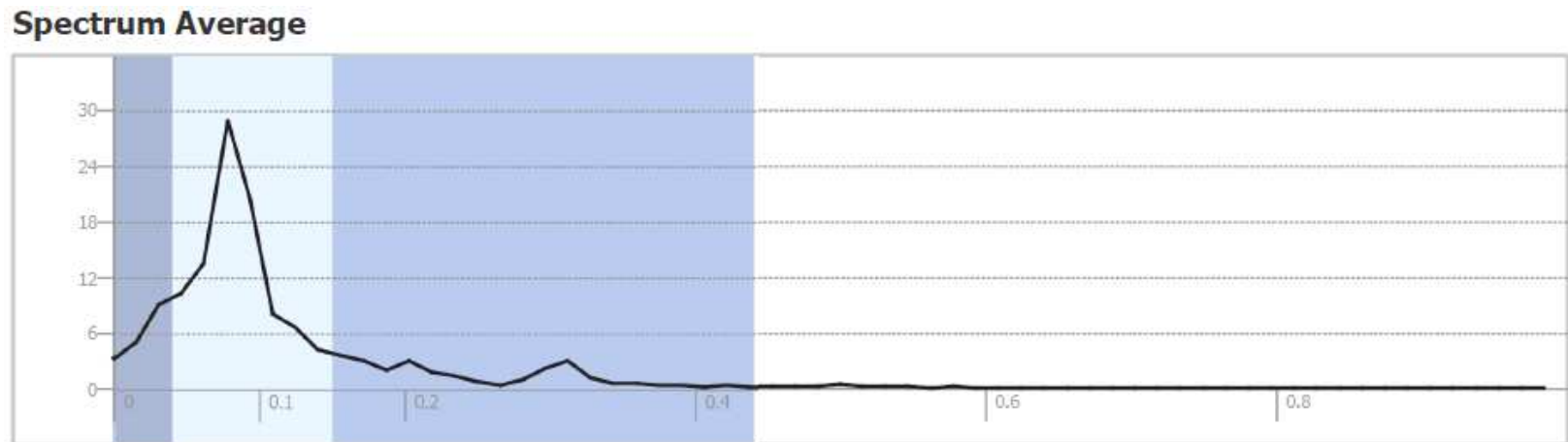


Spectral analysis of the above HRV (frequency axis)

# HRV during Autogenic Training (AT): **Heart**



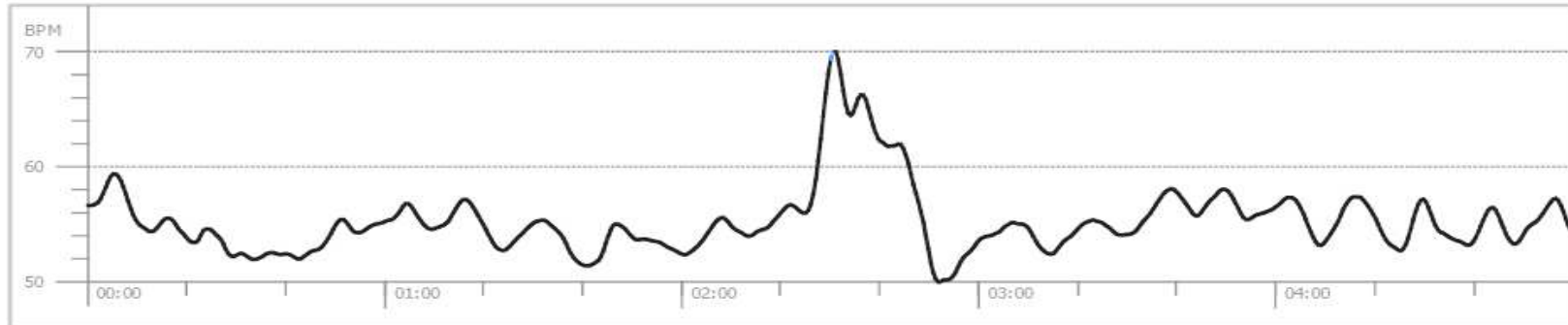
Tachogram (time axis) of HRV during **“my heart goes natural”** formula. Average HR, 61bpm.



Spectral analysis of the above HRV (frequency axis)

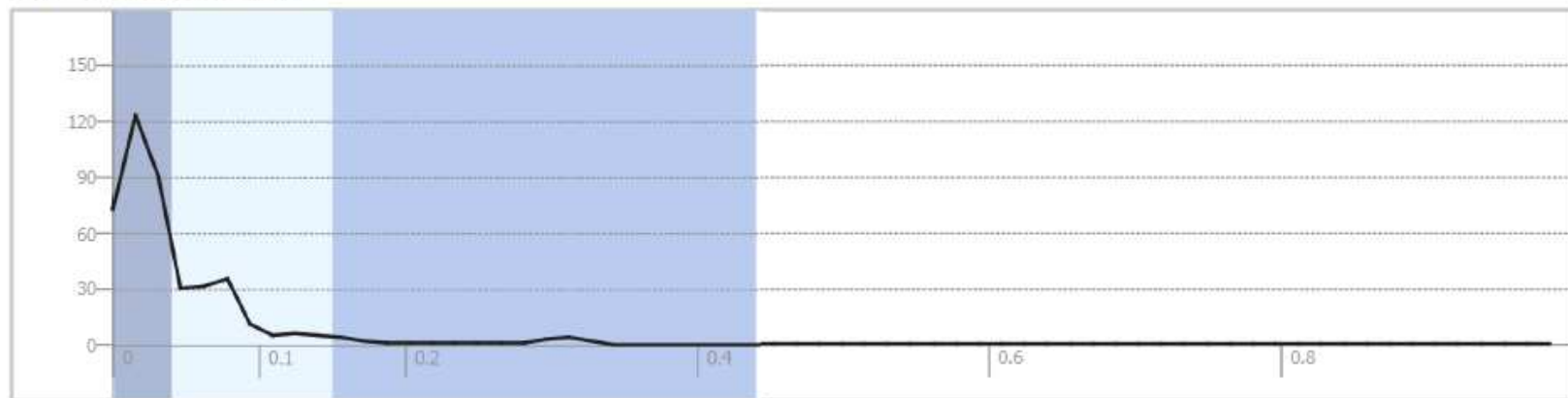
# HRV during Autogenic Training (AT): **Breathing**

## HRV



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

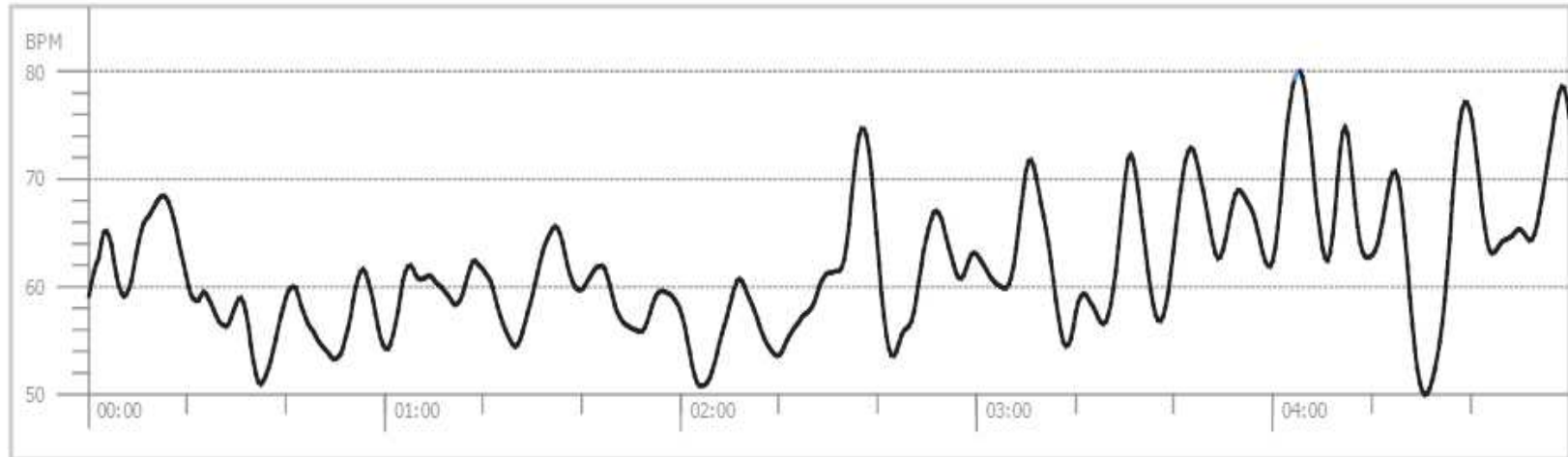
## Spectrum Average



Spectral analysis of the above HRV (frequency axis)

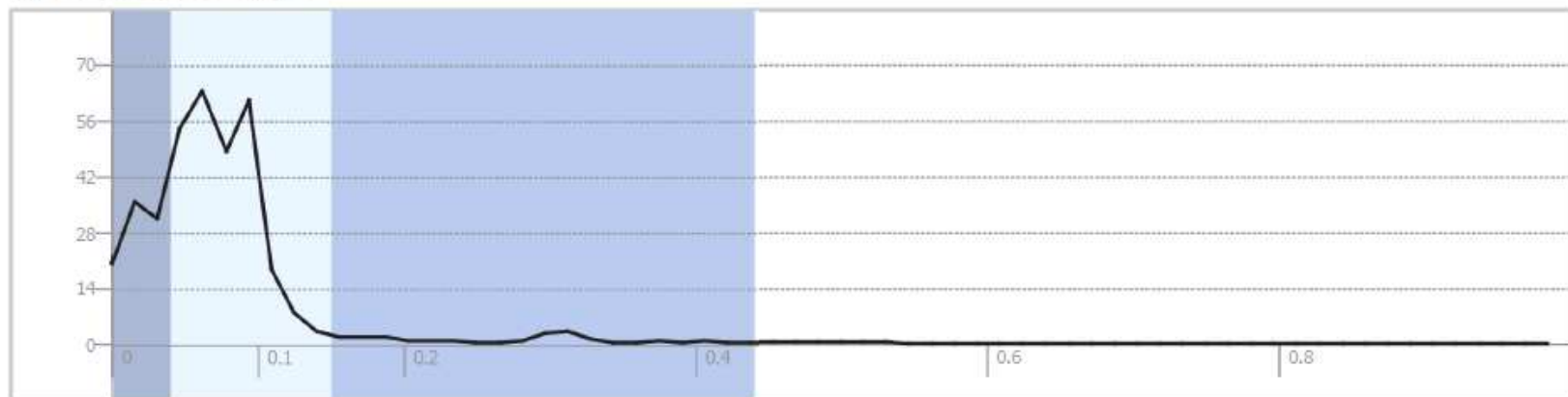
# HRV during Autogenic Training (AT): **Solar plexus**

## HRV



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

## Spectrum Average

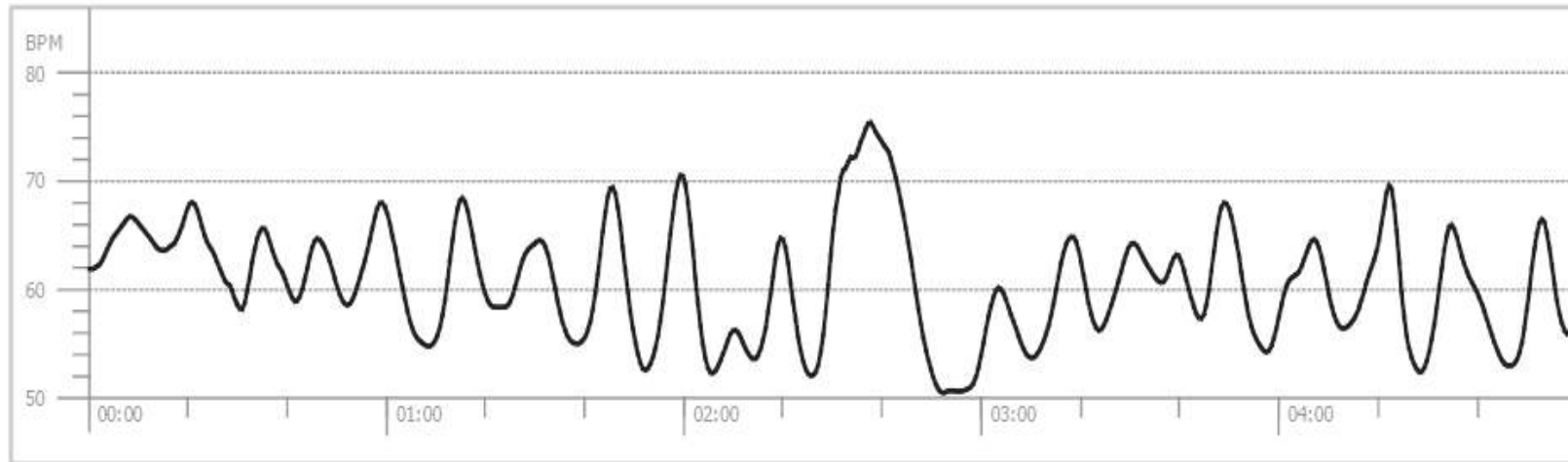


Spectral analysis of the above HRV (frequency axis).



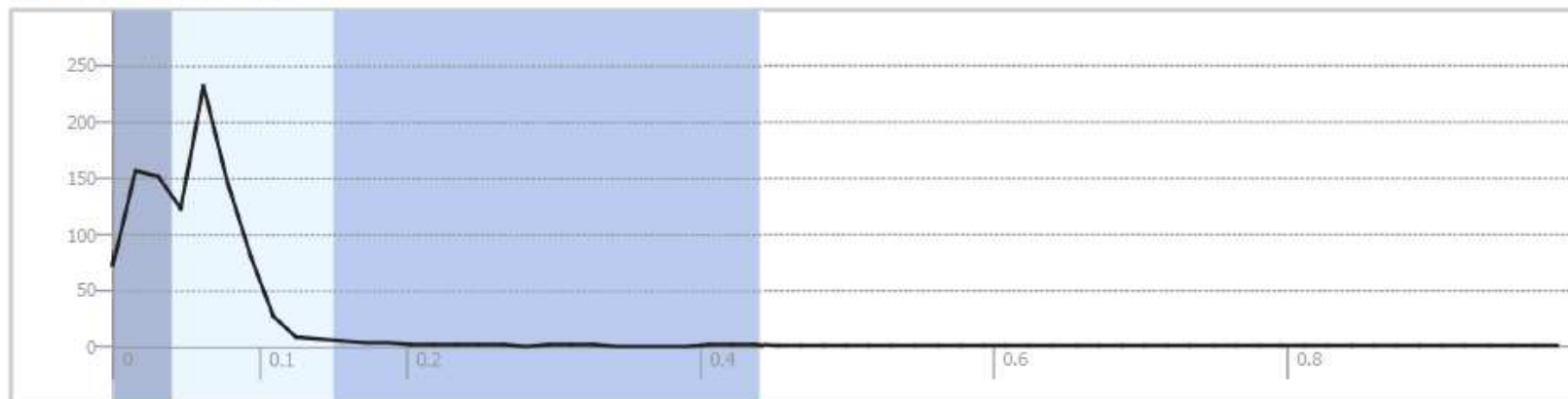
# HRV during Autogenic Training (AT): **Forehead**

## HRV



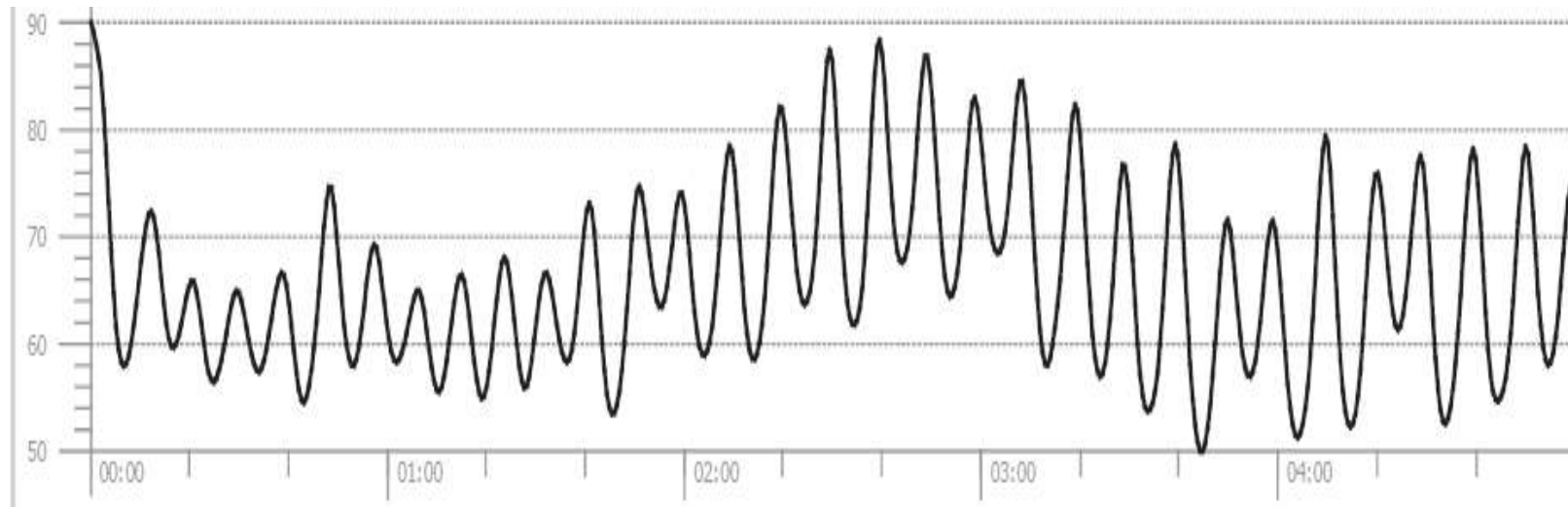
Tachogram (time axis) of HRV during **“my forehead is fresh”** formula. Average HR, 67bpm.

## Spectrum Average



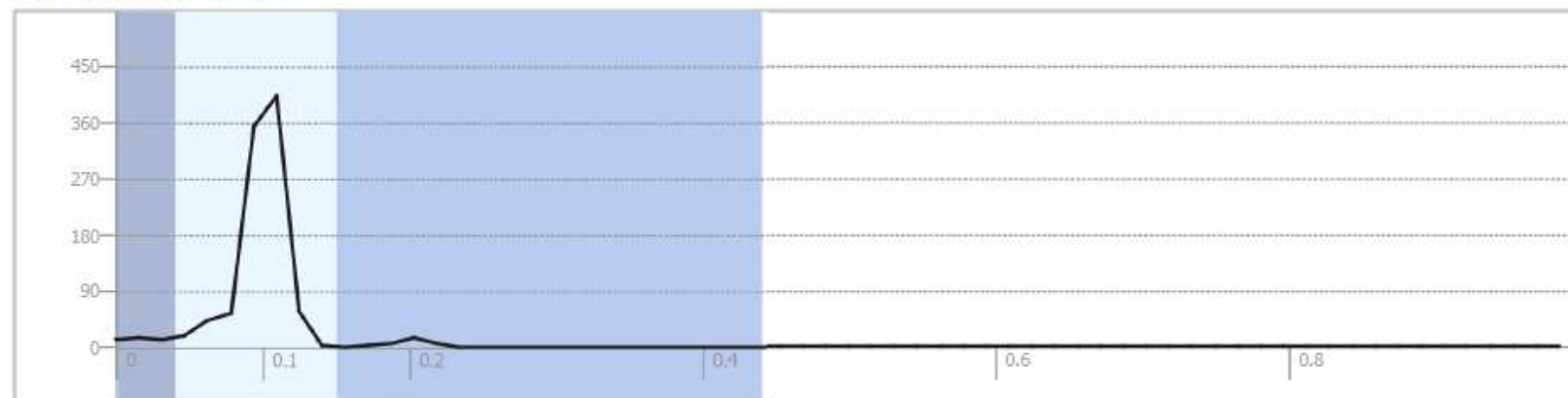
Spectral analysis of the above HRV (frequency axis)

## HRV during CC & AT mix



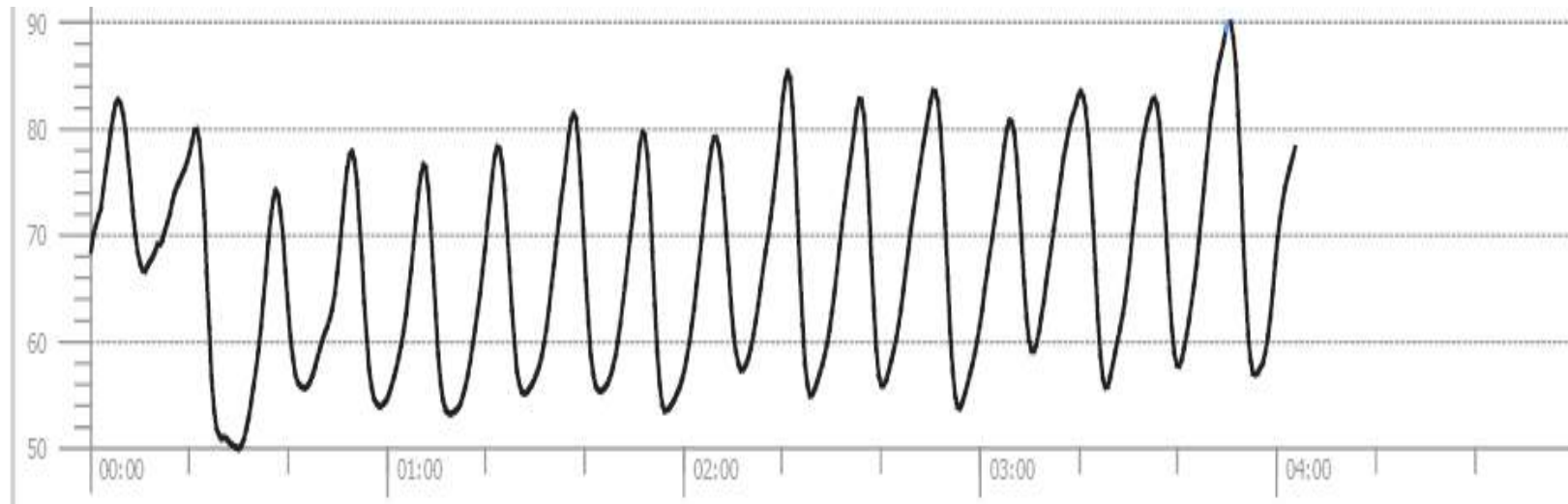
Tachogram (time axis) of HRV during **“my heart breaths happy”** formula sync. with breathing

### Spectrum Average



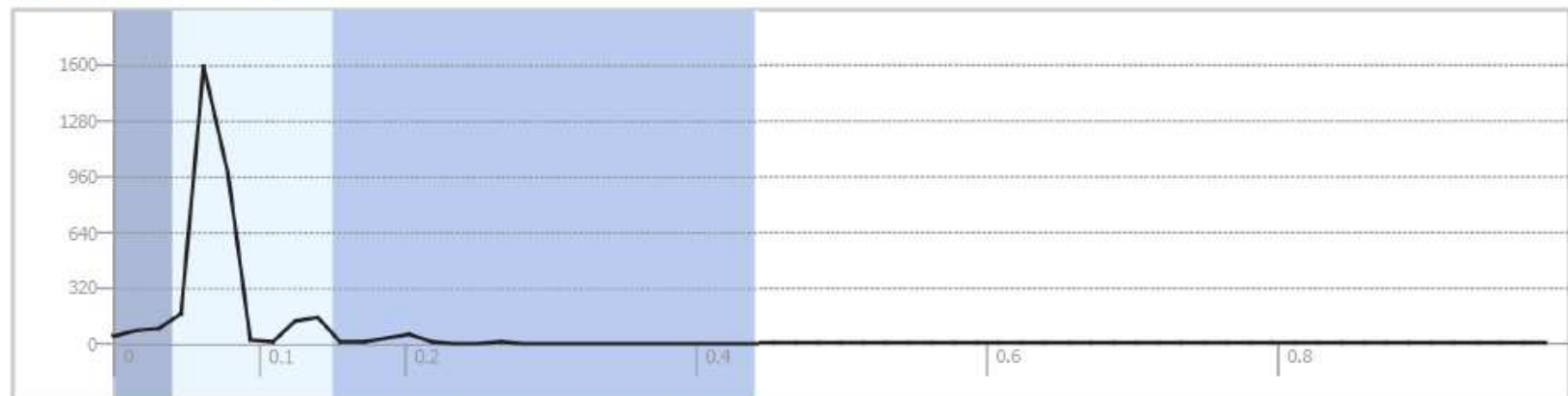
Spectral analysis of the above HRV (frequency axis)

## HRV during mantra (to activate if drowsy driving)



Tachogram (time axis) of HRV during mantra “aaaaah”. 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.



### Recursos de seguridad vial

Fundación LUIKE imparte este curso como parte de su Programa de Formación en Comunicación del Motor y como aportación a la difusión de las buenas prácticas en SEGURIDAD VIAL.

Thank you very much!