Heart Rate Variability - What is it, why does it matter and how does it affect heart health?

06 Jun 2024 15:20 - 15:45 The Whittle

Dr Boon Lim is an NHS consultant Cardiologist, and obtained a PhD from Imperial College on the Autonomic Nervous System in heart rhythm abnormalities. He has published on heart rate variability and having trained as a HeartMath coach, he incorporates breathwork coaching in his day to day practice with cardiac patients, and staff members. In this session, he will discuss why heart rate variability matters, and demonstrate simple training techniques to enhance acute and long term heart rate variability.

Boon Lim

Consultant Cardiologist
Imperial College London

Hasadera Temple, Kyoto, Japan

Causes of heart rate variation

Extrinsic

Stress

1) Physical – running
2) Mental – work deadline
3) Emotional - worries
4) Medical – viral infection, low BP (orthostasis)
5) Sleep deficit
6) Intoxication

Causes of heart rate variation

Intrinsic periodic rhythms

1) Respiratory Sinus Arrhythmia (RSA)
2) Baroreceptor reflexes
3) Thermoregulation
4) Neuroendocrine
5) Circadian
6) Other - seasonal

Causes of heart rate variation

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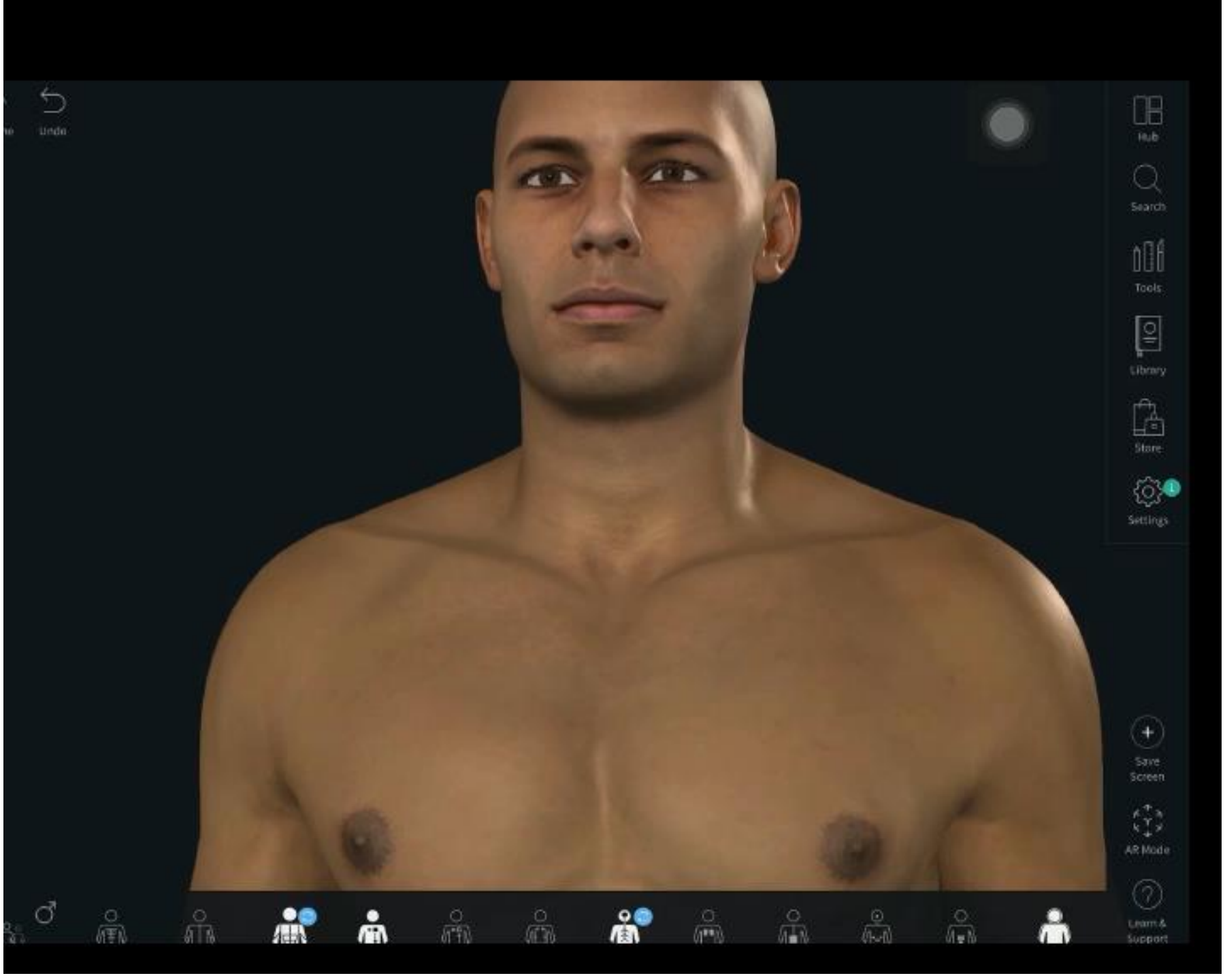
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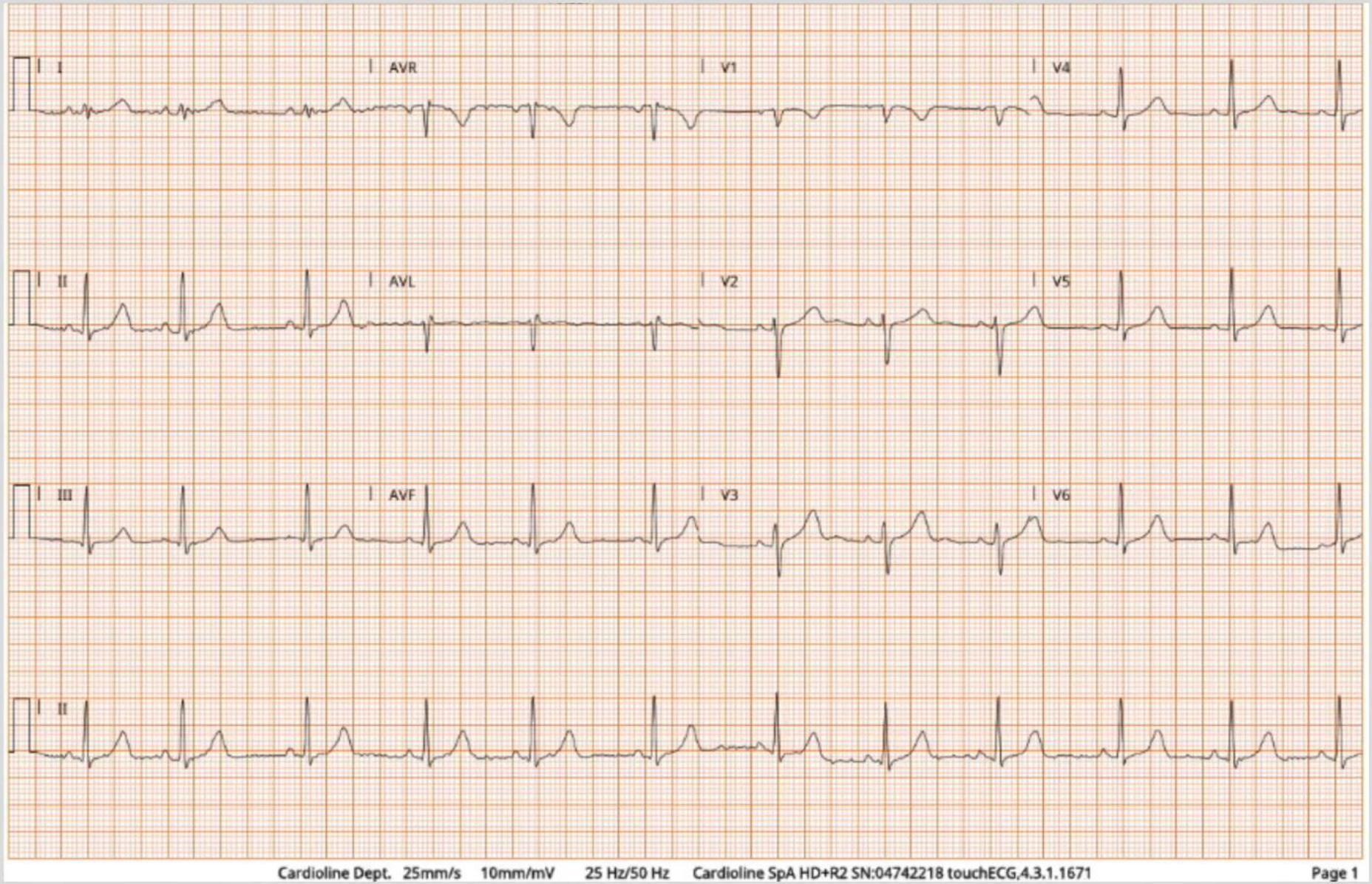
Ways to calculate HRV

1. Time Domain

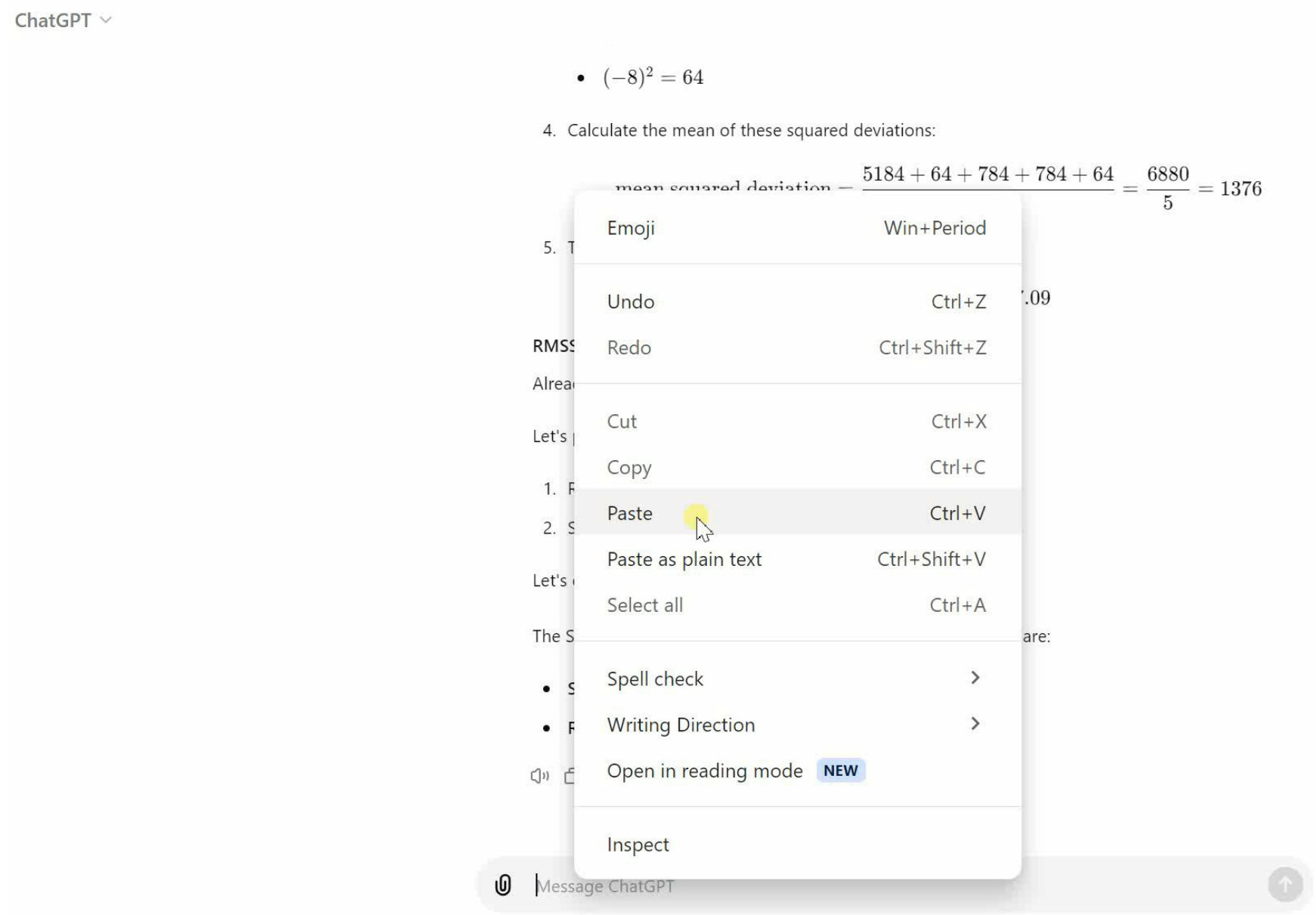
2. Frequency Domain

3. Non-Linear Methods


I
AVR
V1
V4
II
AVL
V2
V5
III
AVF
V3
V6
II
Cardioline Dept. 25mm/s 10mm/mV 25 Hz/50 Hz Cardioline SpA HD+R2 SN:04742218 touchECG,4.3.1.1671
Page 1

Working out RMSSD

(time domain analysis)



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PMCID: PMC5934689
PMID: 29755366

Normal Values of Corrected Heart-Rate Variability in 10-Second Electrocardiograms for All Ages

Marten E. van den Berg,[1] Peter R. Rijnbeek,[1] Maartje N. Niemeijer,[2] Albert Hofman,[2] Gerard van Herpen,[1] Michiel L. Bots,[3] Hans Hillege,[4] Cees A. Swenne,[5] Mark Eijgelsheim,[2,6] Bruno H. Stricker,[2,7,8] and Jan A. Kors[1,*]

- >13,943 ECGs from 5 population studies in Netherlands
- Across all age ranges

Table S5

Percentiles of heart-rate corrected RMSSD (in milliseconds) for women.

Age group	2nd	5th	10th	25th	50th	75th	90th	95th	98th
8 to 12 years	36.1	45.9	56.1	77.5	109.7	155.7	215.8	265.0	338.1
12 to 16 years	30.1	38.5	47.3	65.7	93.6	133.6	186.7	230.7	297.1
16 to 20 years	25.3	32.6	40.3	56.2	80.4	115.3	162.1	201.5	261.8
20 to 30 years	19.8	25.6	31.7	44.5	63.7	91.6	129.5	162.0	212.9
30 to 40 years	15.3	19.7	24.2	33.6	47.7	68.2	96.2	120.3	158.4
40 to 50 years	12.1	15.3	18.6	25.4	35.8	50.8	71.5	89.6	118.5
50 to 60 years	9.5	11.9	14.4	19.5	27.3	38.9	55.5	70.5	95.6
60 to 70 years	8.0	9.9	11.9	16.1	22.6	32.7	48.2	63.6	92.2
70 to 80 years	7.0	8.8	10.6	14.4	20.3	30.2	47.2	66.9	112.1
80 to 90 years	6.3	8.1	9.8	13.5	19.2	29.3	49.7	78.4	166.7

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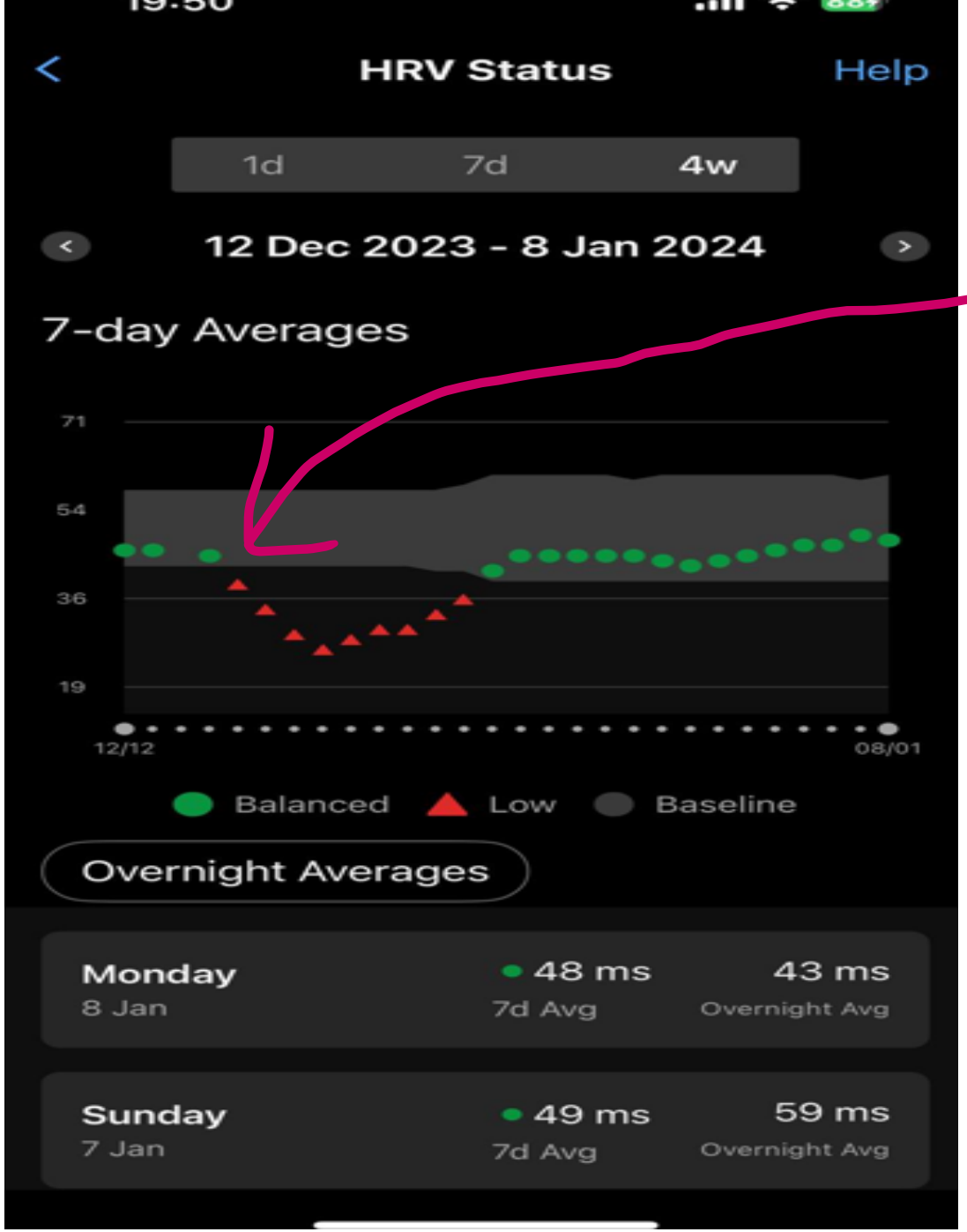
RMSSD median values

Women	
8 to 12 years	109.7
12 to 16 years	93.6
16 to 20 years	80.4
20 to 30 years	63.7
30 to 40 years	47.7
40 to 50 years	35.8
50 to 60 years	27.3
60 to 70 years	22.6
70 to 80 years	20.3
80 to 90 years	19.2

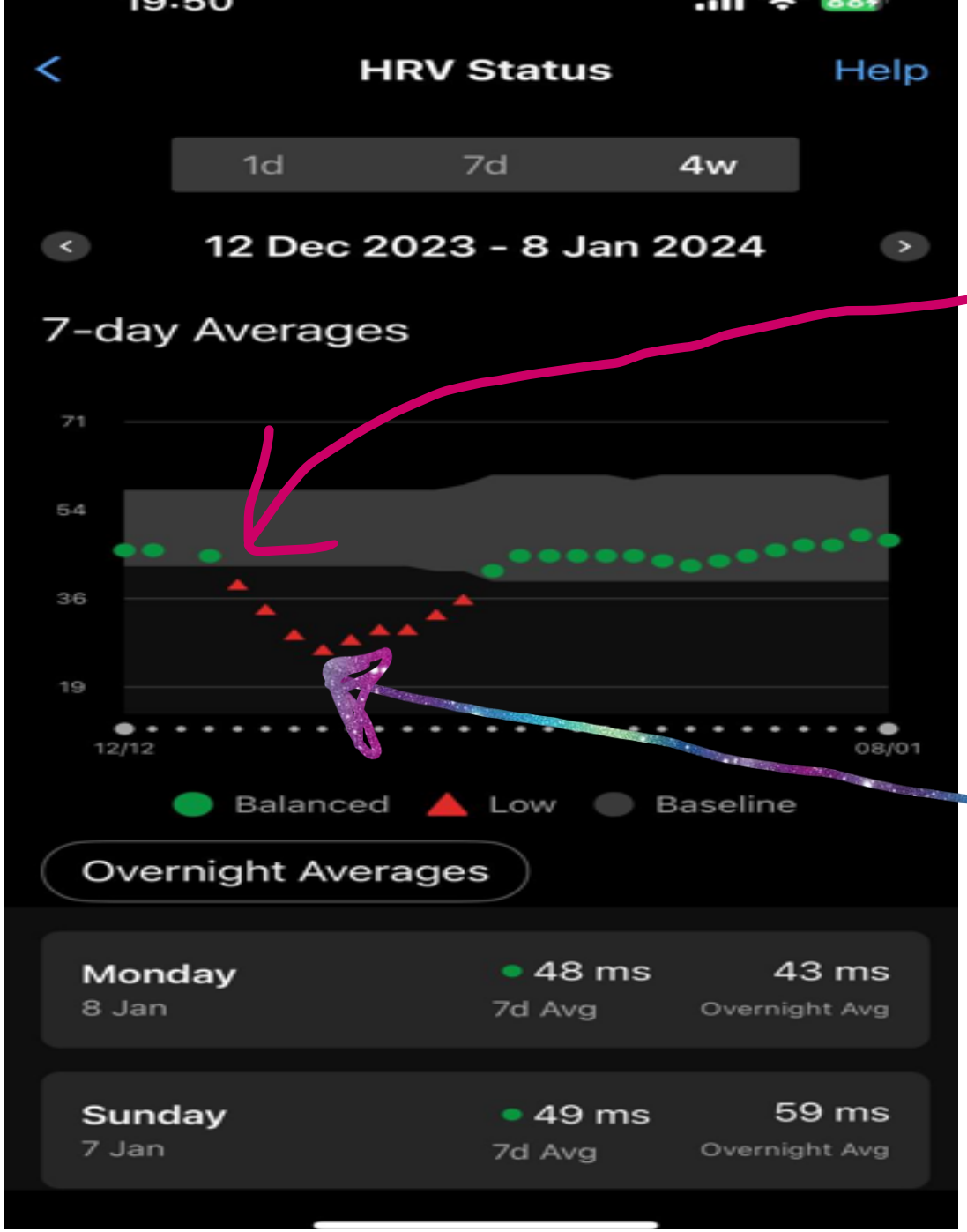
Men	
8 to 12 years	102.1
12 to 16 years	84.8
16 to 20 years	70.1
20 to 30 years	51.9
30 to 40 years	37.7
40 to 50 years	29.9
50 to 60 years	24.1
60 to 70 years	20.7
70 to 80 years	19.0
80 to 90 years	17.9

HRV is an indicator of illness



Onset of Covid @ 1850m
(French Alps)

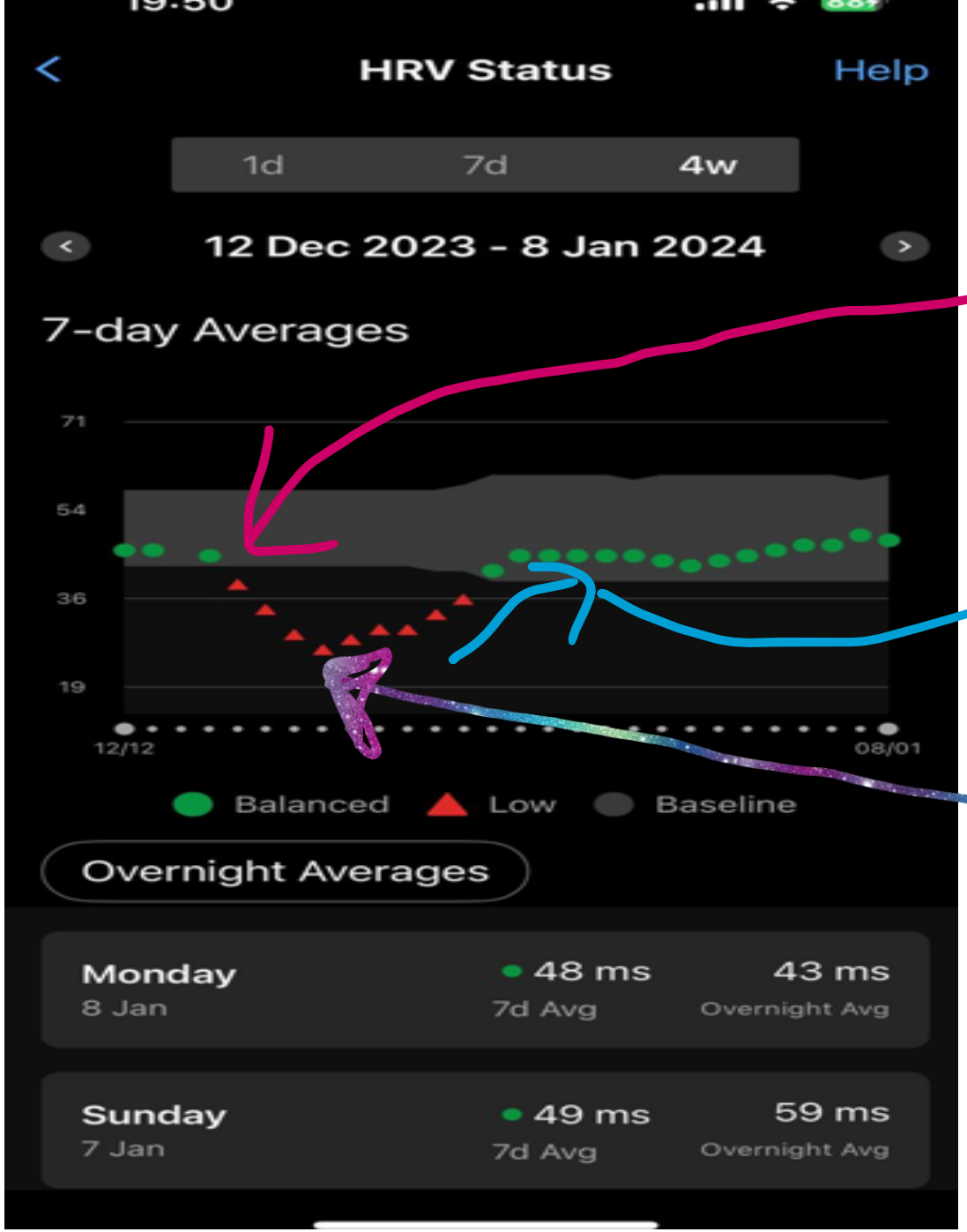
HRV is an indicator of illness



Onset of Covid @ 1850m
(French Alps)

D4 admitted to hospital

HRV is an indicator of illness

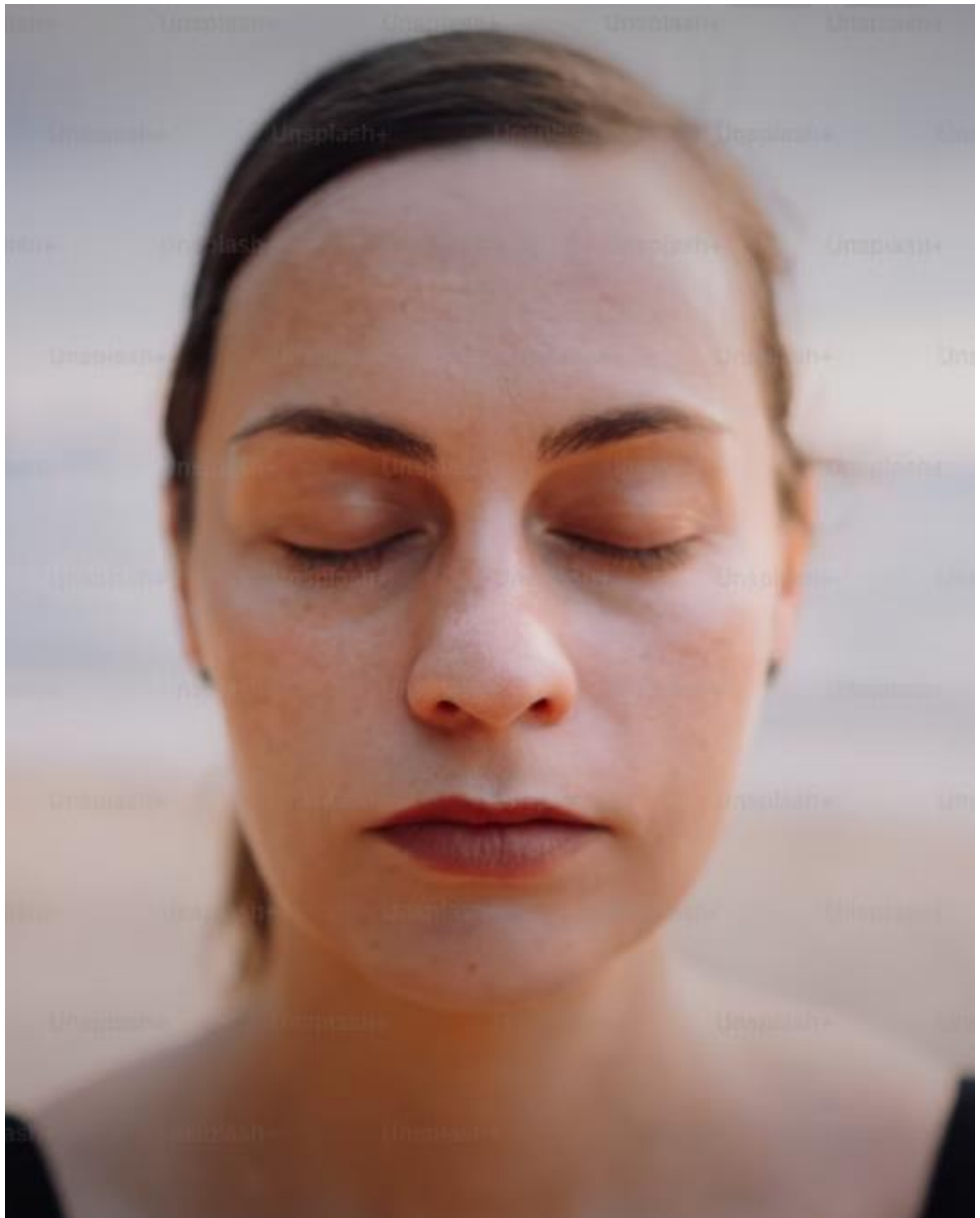


Onset of Covid @ 1850m
(French Alps)

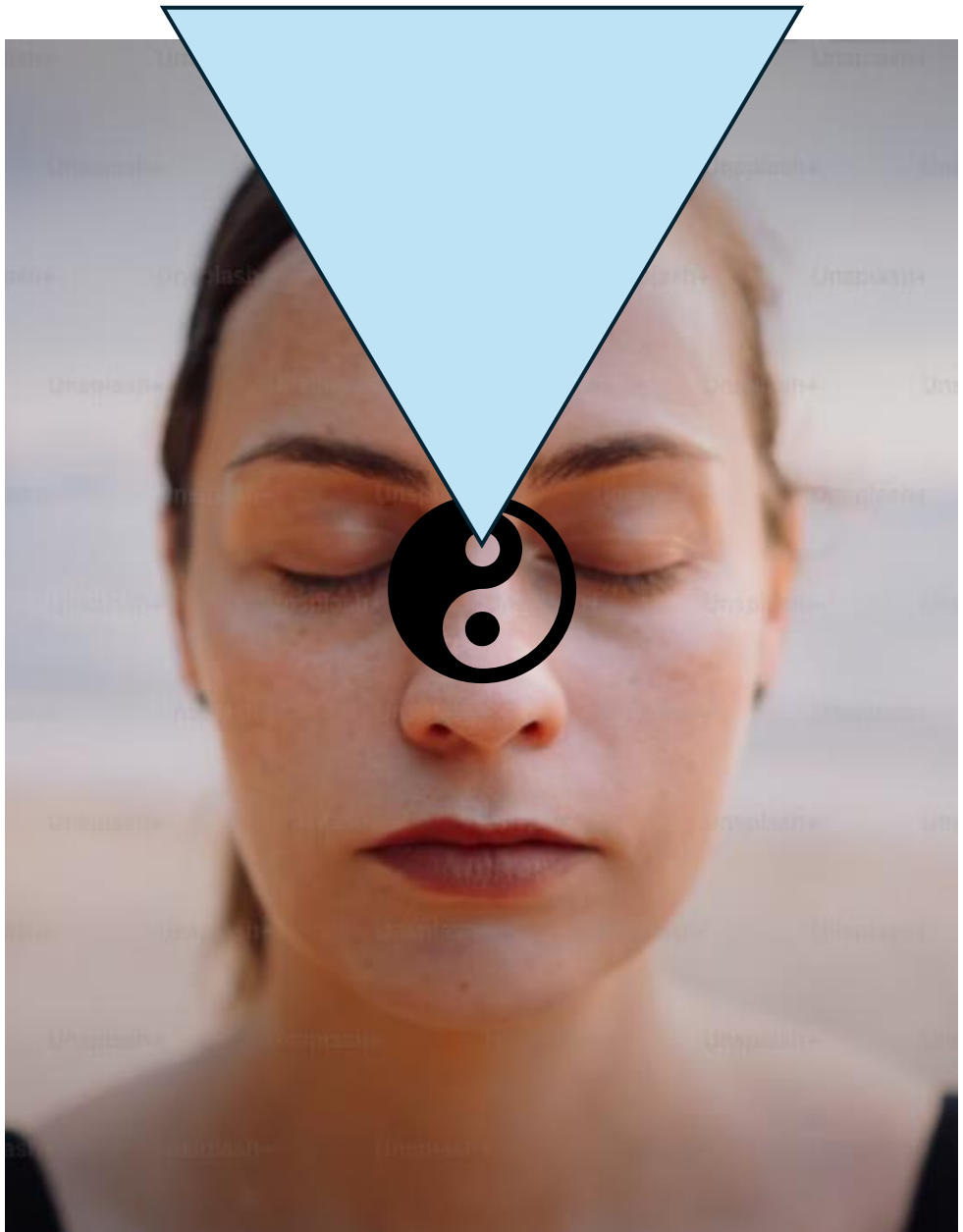
Gradual recovery after 7 days

D4 admitted to hospital

How is HRV controlled?



Top down control of HRV



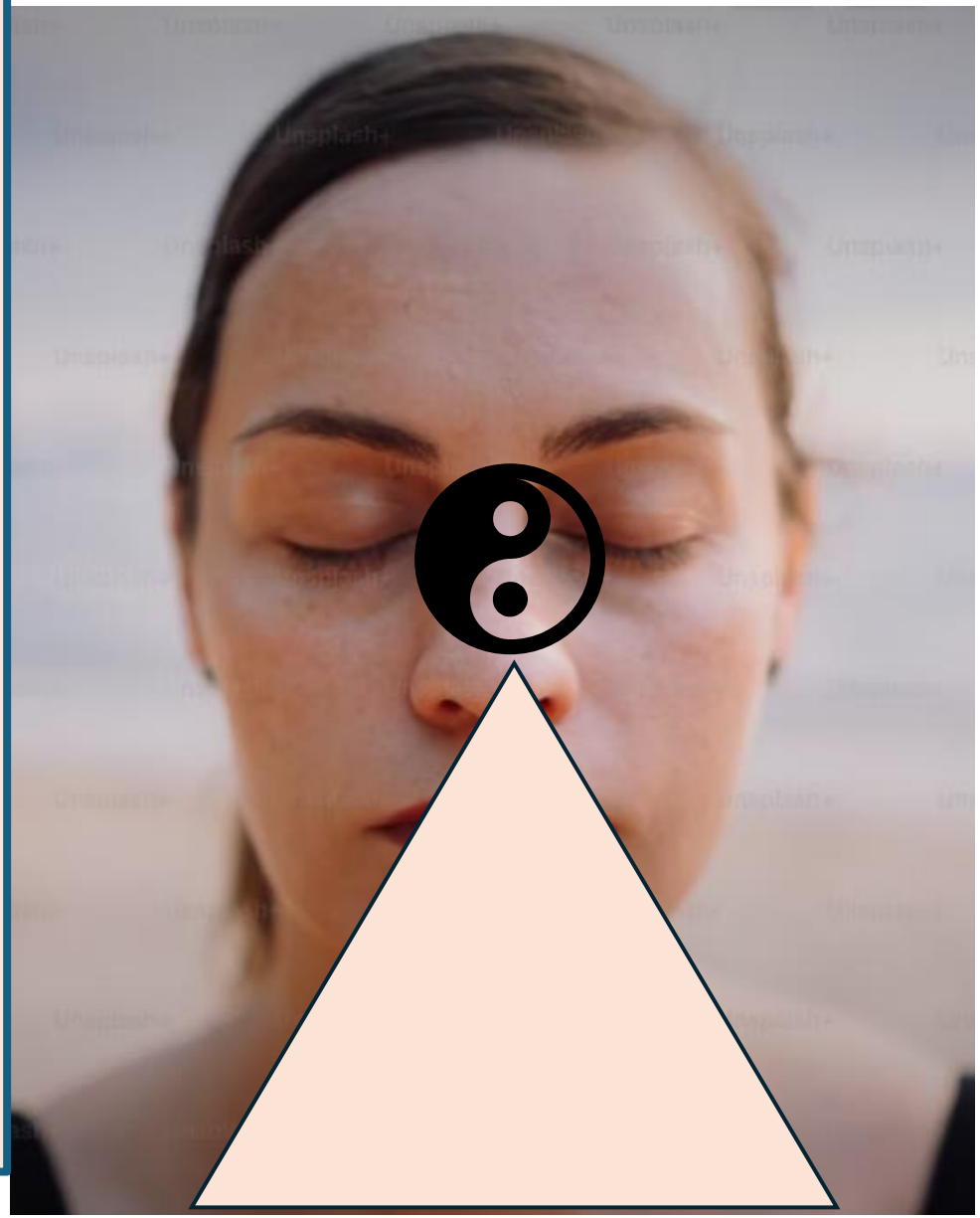
Top Down Approach

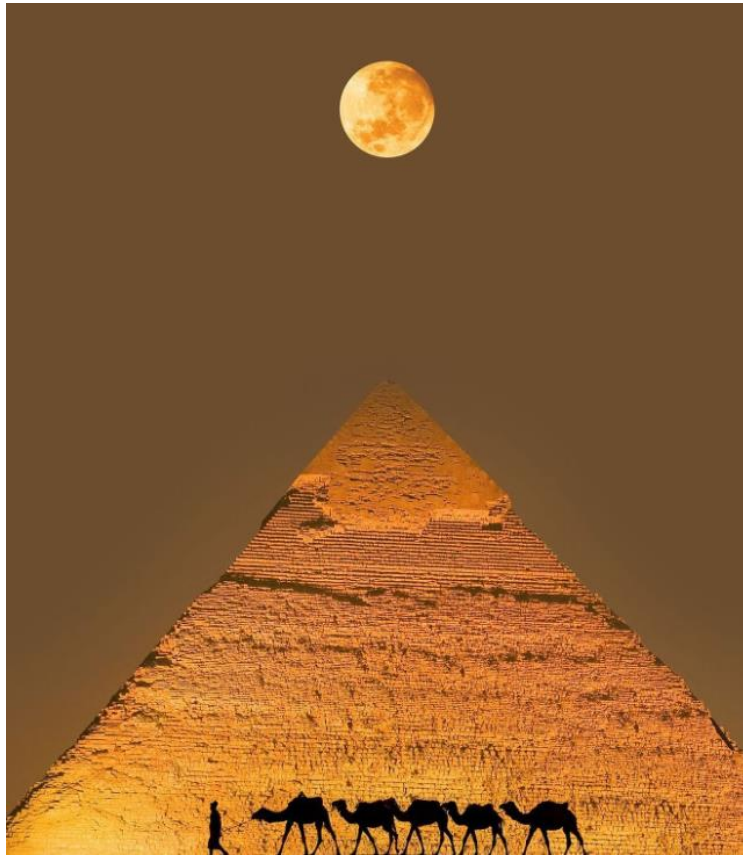
1. Mindfulness
2. Purposeful living
3. Meditation
4. “Present” moment
5. Positive emotions
    i. Equanimity
    ii. Compassion
    iii. Gratitude
    iv. Forgiveness

Bottom up HRV control

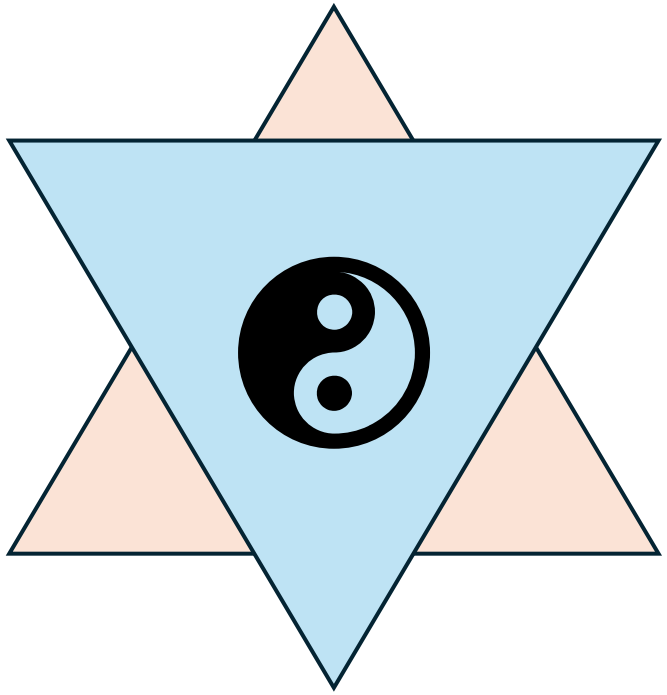
Bottom up control

1. Cold
2. Exercise (acute vs chronic)
3. Eating well
4. Restful and adequate sleep
5. Being in nature
6. Flow states
7. Breathing

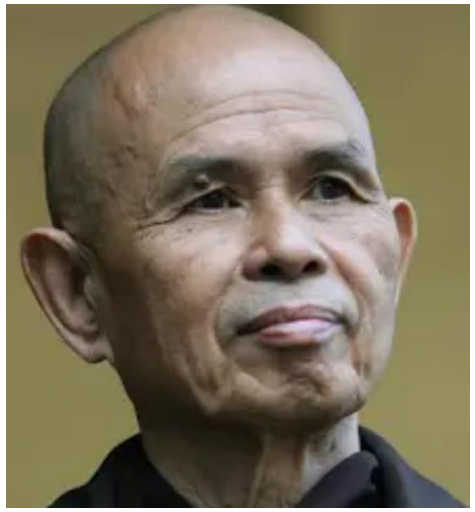


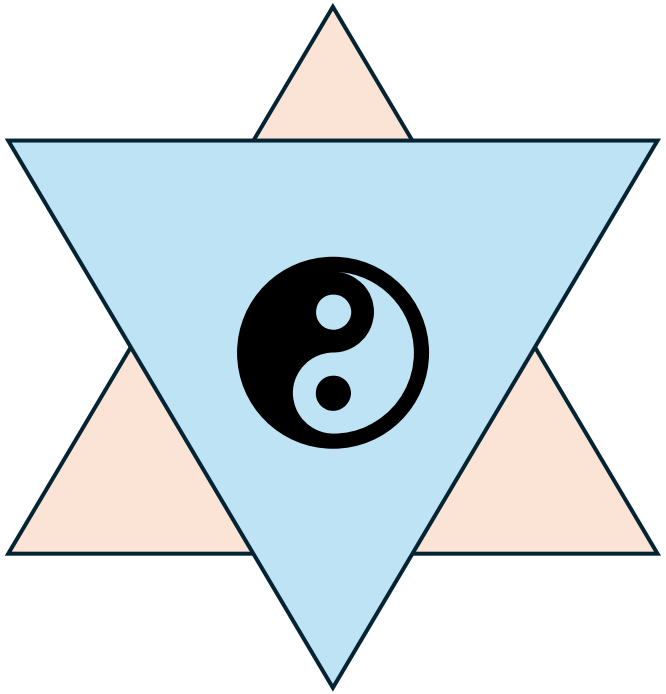


Control of HRV – an individual affair



Control of HRV – an individual affair





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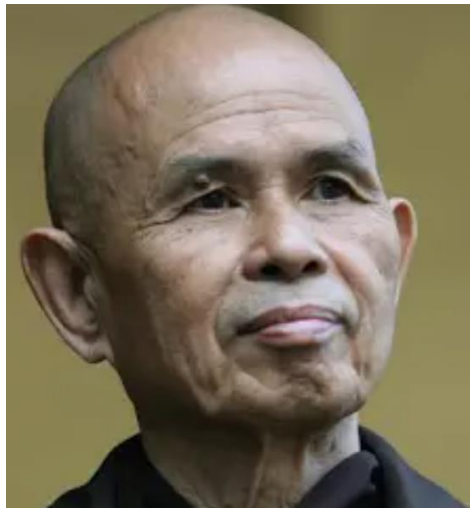

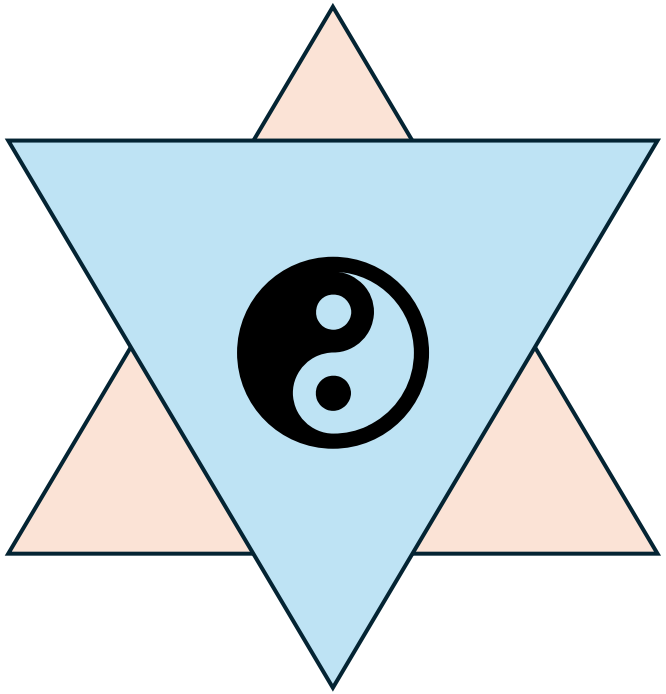

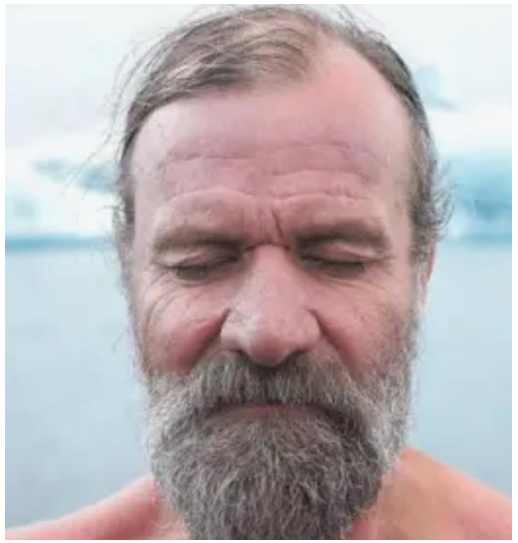

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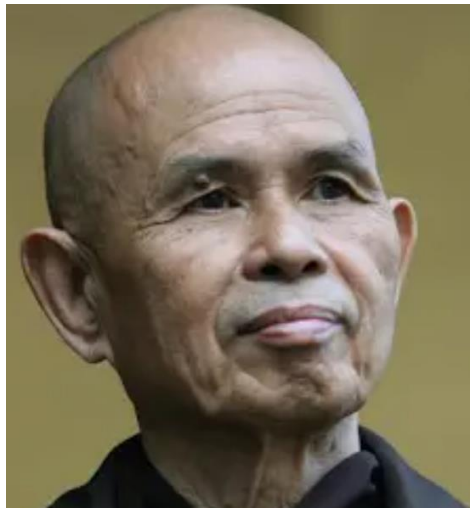

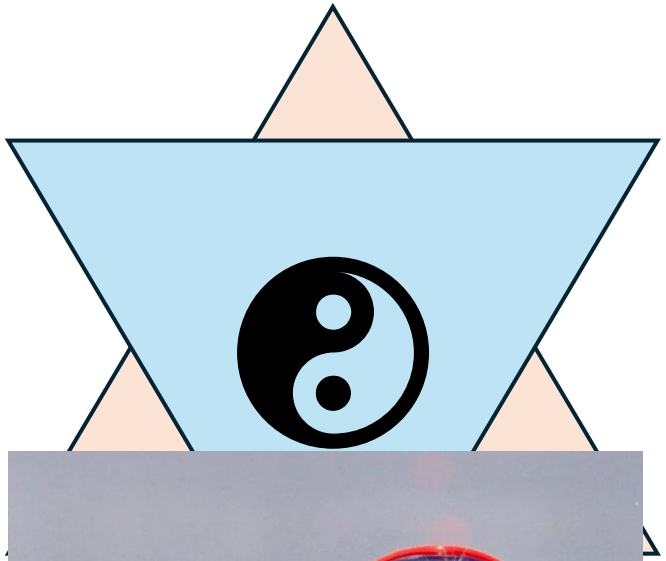

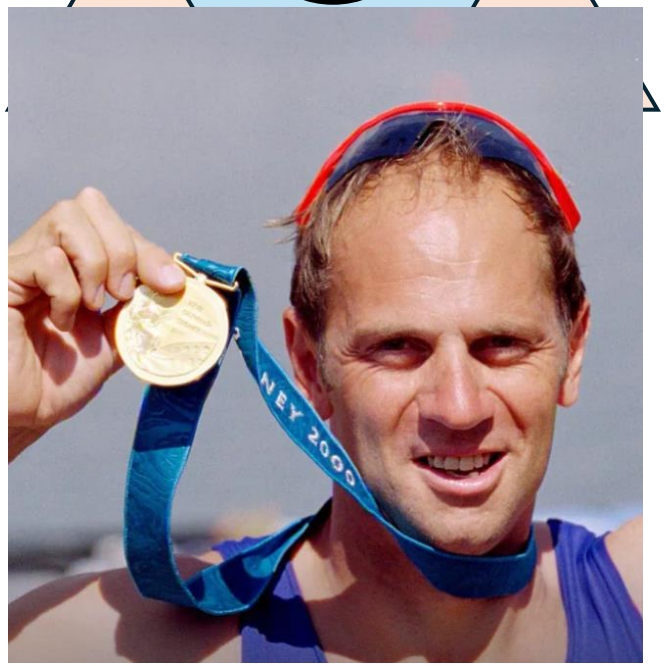

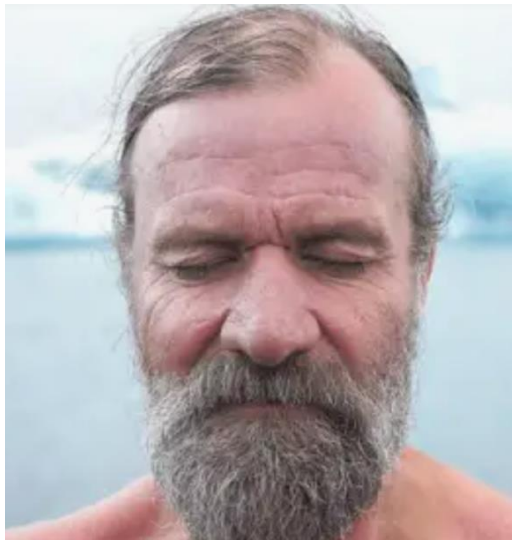

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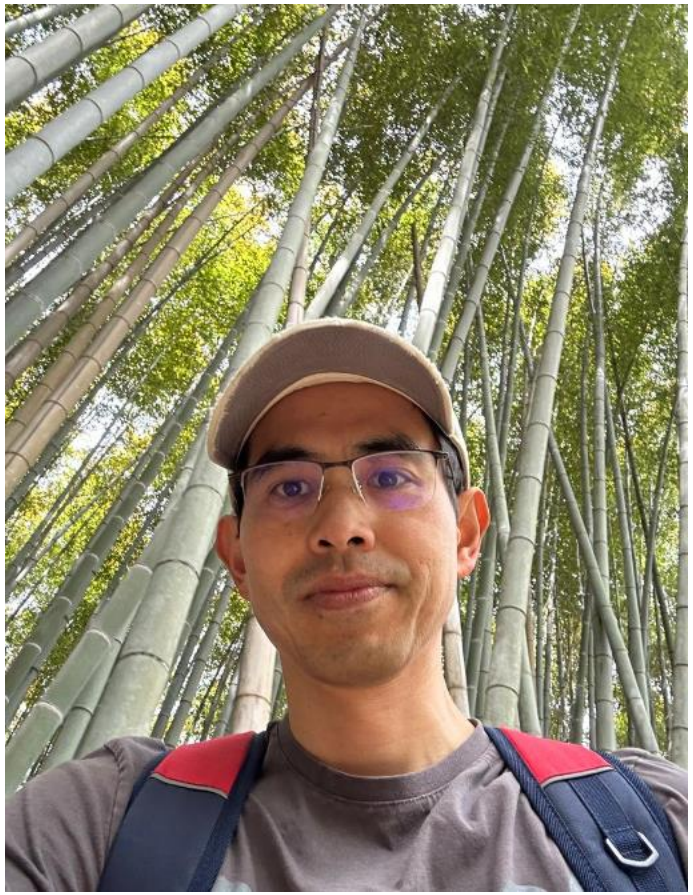
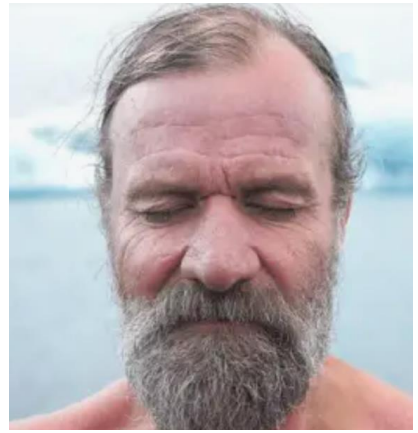




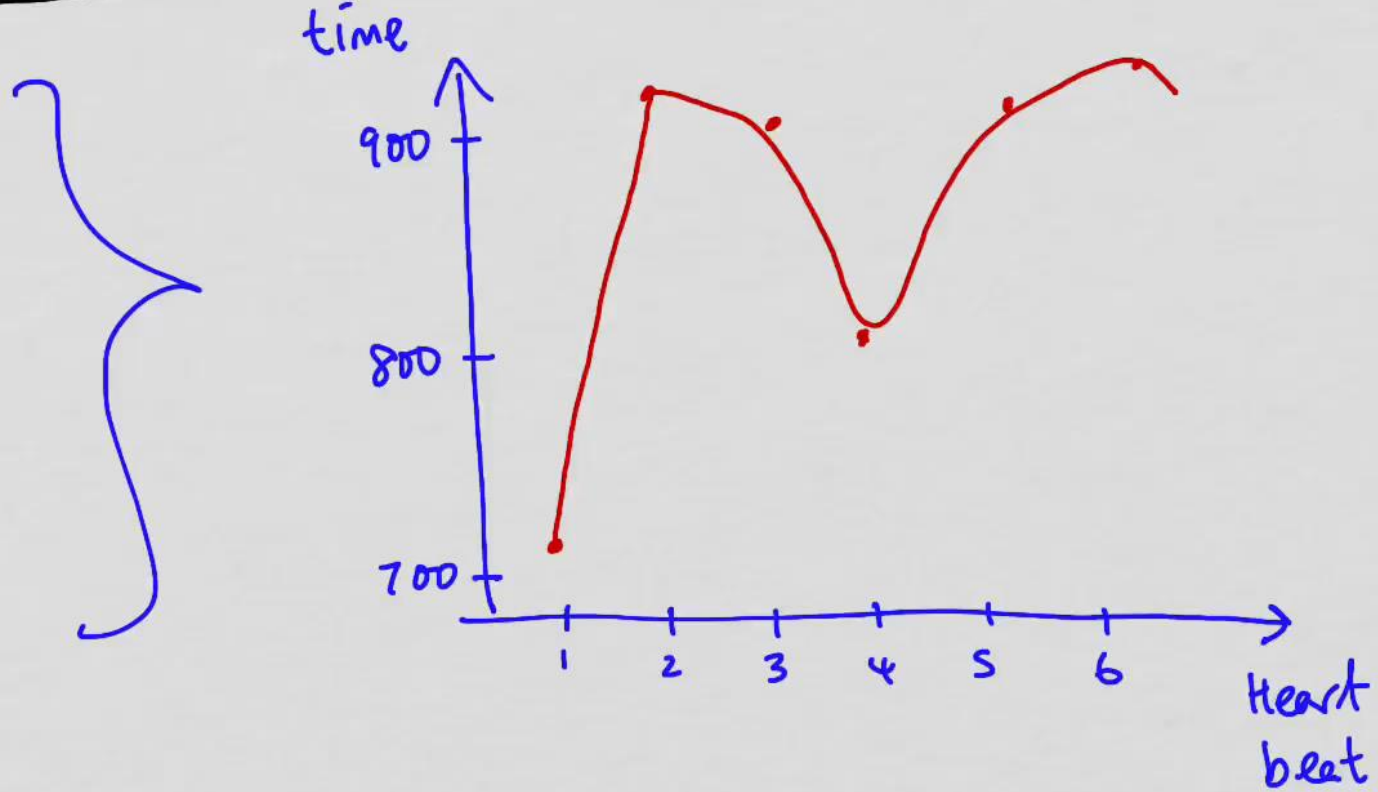
Combining your own bottom up and top down approaches will allow you to achieve your best “HRV”

Frequency domain analysis of HRV

Heartbeat interval list:

(ms)

1. 720
2. 920
3. 900
4. 800
5. 900
6. 920



Bottom up HRV control

Bottom up control

1. Cold
2. Exercise (acute vs chronic)
3. Eating well
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5. Being in nature
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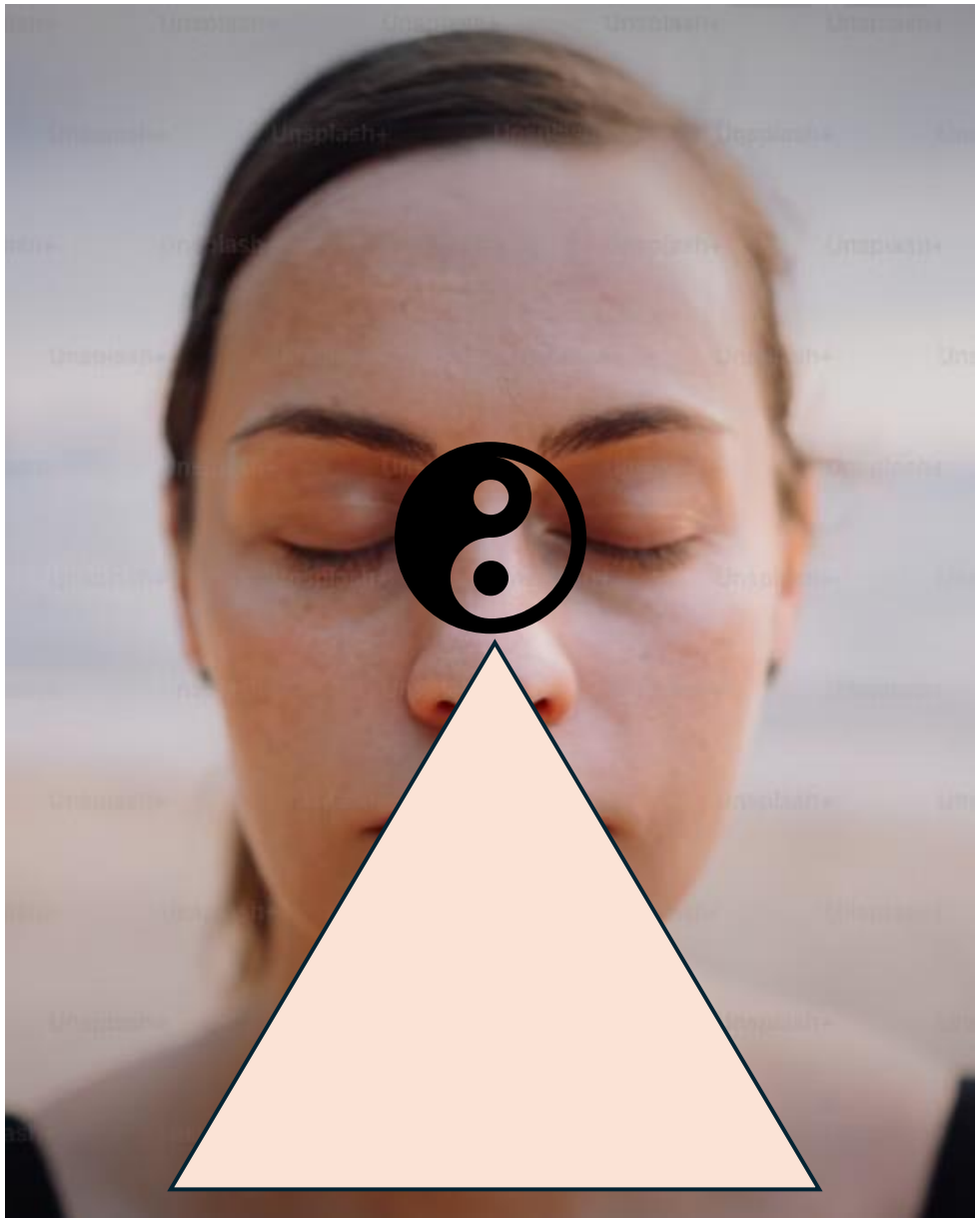
7. Breathing



Breathing is the most rapid and effective “bottom up” approach to increase HRV and achieved coherence in a moment

i. Diaphragmatically - ie belly breathing!

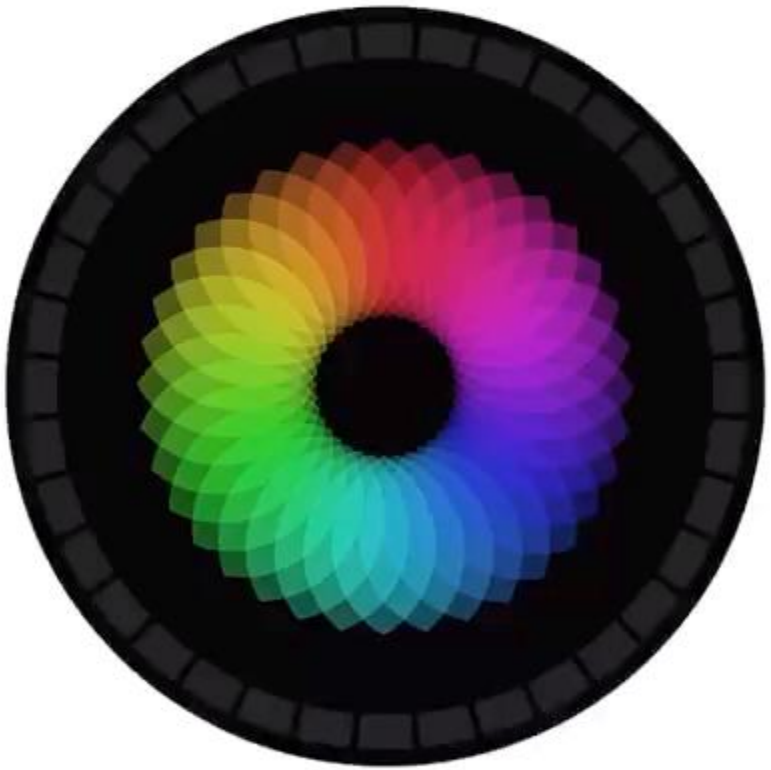
Babies just “know” how to use their diaphragm

Breathing is the most rapid and effective “bottom up” approach to increase HRV and achieve coherence in a moment

i. Diaphragmatically
ii. Rhythmically
iii. Evenly
iv. Slowly
v. Nasally (inbreath), various techniques (out)
vi. Through the heart – i.e. adding in “top down” ie. With gratitude/compassion etc

Session

HRV



Calibrating...

Session Review Journal Guides HeartCloud

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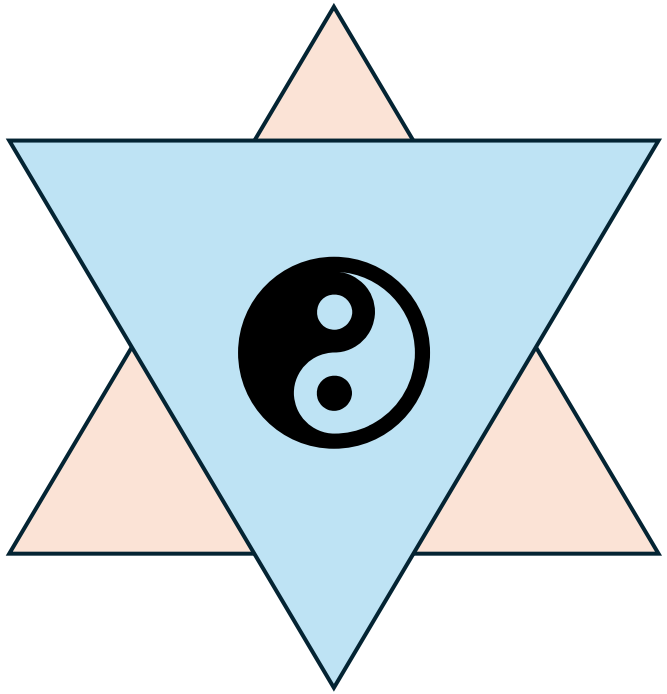

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